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CERAMBYCIDAE OF NORTHERN ASIA

VOLUME 2
Cerambycinae
Part II

[*Usachi Severnoi Azii* (*Cerambycinae*)]

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A.I. CHEREPANOV

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This monograph on the subfamily Cerambycinae is published in two parts. Part I, published in 1981, contains keys to the tribes based on adult insects, larvae, and pupae of the subfamily Cerambycinae, and information on the ecology of 23 genera and 47 species of the tribes Hesperophanini, Cerambycini, Callidiopini, Graciliini, Obriini, Nathriini, Molorchini, Dilusini, Callichromini, Rosaliini, and Callidiini. The material for Part II (the present book) was collected during many years of investigations. This book presents keys to the genera and species of the tribes Clytini and Stenaspini based on various developmental stages, and a detailed description of the morphology, geographic distribution, and biology of cerambycids (14 genera, 61 species). In the last two years three species have been added to the list of cerambycids of these tribes: *Xylotrechus clarinus* Bat. and *X. villioni* Vill., found in Kunashir Island, and *X. nadezhdae* Tsher., sp. n., discovered by the author in the forests of the southern spur of Sikhote-Alin'. From 1980 to 1981 the biology of *Xylotrechus rufilius* Bat. was studied, and new information obtained on the biology of *X. cuneipennis* Kr., *Epiclytus ussuricus* (Pic), and other species.

Workers engaged in the control of forest pests, entomologists, ecologists, and university students and teachers will benefit from this monograph.

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V. Subfamily Cerambycinae

23. Tribe CLYTINI

5 Adult insect characterized by elongate or moderately elongate body. Frons with smooth median longitudinal carinae (*Xylotrechus*) or median flat and wide groove, which is sometimes longitudinal (*Clytus*, *Chlorophorus*). Eyes with minute facets, notched in upper half. Antennae relatively short, do not extend beyond middle of elytra (*Xylotrechus*, many species of *Clytus*, *Chlorophorus*), rarely extend beyond or reach apex of elytra (some members of *Clytus*, *Chlorophorus*, *Epiclytus*, *Plagionotus*). Pronotum rounded on sides, without tubercles, oblong (*Rhaphuma*, *Aglaophis*) or transverse (*Plagionotus*, some members of *Xylotrechus*), i.e., length not greater than width. Scutellum pointed posteriorly, triangular, or rounded. Elytra more (*Rhaphuma*) or less (*Xylotrechus*) elongate, apically truncate (many species of *Clytus*, *Rhaphuma*, *Aglaophis*, *Chlorophorus*), rarely rounded (*Plagionotus*, some species of *Xylotrechus*, *Epiclytus*), and usually with spots and crossbands. Legs relatively long; hind femora thicken gradually distally, rarely appear almost clavate.

Larva characterized by half or slightly more than half of head retracted into prothorax. Frontal suture and median longitudinal suture of epistoma poorly developed or not visible for most part. Epistoma fused with parietals. Ocelli well developed; some genera (*Xylotrechus*, *Clytus*, *Chlorophorus*) with one ocellus on each side of head, others (*Epiclytus*, *Plagionotus*) with three ocelli near antennal base. Pronotum with transverse, alveolate, slightly or distinctly notched rusty or yellowish spots in anterior third, which form transverse streaks at anterior margin, and with dull yellowish spots on sides. Pronotal shield in a few species (*Xylotrechus*) sclerotized, with yellowish tinge, in some species (*Clytus*, *Chlorophorus*, some *Xylotrechus*) nonsclerotized, leathery, and white. Thoracic legs lacking (*Xylotrechus*, *Clytus*, *Brachyclytus*) or in form of small segmented, sometimes barely discernible process, with small claw (many species of *Chlorophorus*, *Plagionotus*, *Teratoclytus*). Thoracic legs better developed in mature larvae before pupation [*Chlorophorus gracilipes* (Fald.)]. Locomotory ampullae developed on abdominal segments I to VII; in some (a few species of *Xylotrechus*) ampullae sclerotized, but in most nonsclerotized and leathery.

Pupa with fairly (*Rhaphuma*, *Aglaophis*, some species of *Chlorophorus*) or moderately (*Xylotrechus*, *Plagionotus*) elongate body. Antennae flexed to sides, with apices curved backward (*Xylotrechus*, *Clytus*, *Brachyclytus*), 6 or incurved (*Plagionotus*, some *Chlorophorus*), or highly bent forward on inner side (*Teratoclytus*). Pronotum covered with spinules (*Xylotrechus*, *Clytus*, *Plagionotus*) or bristles form posteromedial transverse stripe (*Chlorophorus*, *Teratoclytus*, *Aglaophis*). Abdomen narrow (*Rhaphuma*, *Paraclytus*) or broadens slightly medially (*Xylotrechus*, *Plagionotus*), with well-developed spinules on tergites.

The northern Asian tribe Clytini includes 11 genera with 51 species. *Xylotrechus*, *Clytus*, *Chlorophorus*, and *Plagionotus* are the richest in species. Some genera (*Brachyclytus*, *Epiclytus*, *Teratoclytus*) are monotypic in northern Asia. Ecologically, most species of the genera of this tribe are associated with deciduous (broad-leaved) trees. Only a few species [*Xylotrechus altaicus* (Gebl.), *Clytus arietoides* Reitt.] develop on conifers. Many species, living predominantly in broad-leaved forests, are related to the fossil group. This indicates the origin of Clytini during the Tertiary period. It evolved maximally just prior to the Quaternary period and has since existed in the continents of the Old and New Worlds. The polymorphic genera *Xylotrechus* and *Clytus* are common to these continents. In North America the former genus includes 22 species and the latter seven (Linsley, 1964).

KEY TO GENERA

Adult Insects

1 (12). Episternum of metathorax 2.0 to 3.0 times longer than wide.
2 (3). Frons with well-developed median longitudinal carinae. . . . . 1. **Xylotrechus** Chevr.
3 (2). Frons medially flat, without carinae, often with longitudinal groove.
4 (9). Antennae notably thicken distally, short, barely reach or do not reach middle of elytra.
5 (6). Scutellum broadly rounded anteriorly. . . . . . 2. **Clytus** Laich.
6 (5). Scutellum pointed anteriorly, not rounded, triangular.
7 (8). Elytra without long erect setaceous hairs. Erect hairs present only in anterior third of elytra. . . . . 3. **Brachyclytus** Kr.
8 (7). Elytra with long erect setaceous hairs posterior to middle. Erect hairs also present in anterior third of elytra. . . . . 4. **Cyrtoclytus** Ganglb.
9 (4). Antennae uniform, filiform or notably thinner distally, pointed at apex, long, and extend beyond middle of elytra.

10 (11). Antennae filiform, slender. Pronotum oblong. . . . . 5. **Epiclytus** Gress.

11 (10). Antennae setaceous, thick, markedly taper distally. Pronotum transverse, in any case its length not more than width. . . . . 6. **Plagionotus** Muls.

12 (1). Episternum of metathorax 4.0 times longer than wide.

13 (18). First segment of hind tarsus longer than all successive segments together.

14 (17). Antennae shorter or barely longer than body, without white hairy ring on 6th segment.

7 15 (16). Body moderately elongate. Femora not clavate, gradually thicken distally. . . . . 7. **Chlorophorus** Chevr.

16 (15). Body markedly elongate. Femora clavate, distinctly thicken distally, and with long thin shaft. . . . . 8. **Rhaphuma** Pasc.

17 (14). Antennae long, slender, 1.5 (female) or 2.0 (male) times longer than body, and with white dense hairy ring on 6th segment. . . . . 9. **Teratoclytus** Zaitz.

18 (13). First segment of hind tarsus not longer than all successive segments together.

19 (20). Elytra without distinct basal tubercles on sides of scutellum and apically with barely pointed, rounded outer angle. . . . . 10. **Paraclytus** Bat.

20 (19). Elytra with highly convex and often elongate basal tubercles on sides of scutellum, apically with subulate produced outer angle. . . . . 11. **Aglaophis** Thoms.

Larvae

1 (8). Thoracic legs lacking. One ocellus near antennal base.

2 (3). Pronotal shield sclerotized [*X. altaicus* (Gebl.)]; if not sclerotized [*X. arvicola* (Oliv.)], then hypostoma with deep notch on anterior margin near inner angles of sclerites. Found on deciduous and coniferous trees. . . . . 1. **Xylotrechus** Chevr.

3 (2). Pronotal shield not sclerotized, hypostoma with barely perceptible notch near inner angle of sclerites on anterior margin.

4 (7). Gular plate broad and transverse.

5 (6). Spots in anterior third of pronotal disk pale, without whitish dots. Found on deciduous and coniferous trees. . . . . 2. **Clytus** Laich.

6 (5). Spots in anterior third of pronotal disk contrasting, rusty, with whitish dots. Found on grape. . . . . 3. **Brachyclytus** Kr.

7 (4). Gular plate not broad, oblong. Found on deciduous trees. . . . . 4. **Cyrtoclytus** Ganglb.

8 (1). Thoracic legs present; if lacking (some species of *Chlorophorus*), then dorsal locomotory ampullae with transverse groove. One to three ocelli near antennal base.

9 (12). Parietals with three ocelli near antennal base.

10 (11). Ocelli black, pigmented, and contrastingly prominent. Found on deciduous trees. . . . . 5. **Epiclytus** Gress.

11 (10). Ocelli hyaline, usually nonpigmented or slightly pigmented, convex, and not contrastingly prominent. Found on deciduous trees. . . . . 6. **Plagionotus** Muls.

12 (9). Parietals with one hyaline ocellus near antennal base.

13 (14). Dorsal locomotory ampullae moderately convex, with transverse groove in anterior half giving rise to three short longitudinal grooves posteriorly—one median and two lateral. . . . . 7. **Chlorophorus** Chevr.

14 (13). Dorsal locomotory ampullae tubercular, markedly convex, without transverse grooves in anterior half, at most with transverse raylike fold originating from lateral longitudinal groove.

15 (16). Dorsal locomotory ampullae with large number of longitudinal wrinkles. Predominantly found on maple and hornbeam. . . . . 8. **Rhaphuma** Pasc.

8 16 (15). Dorsal locomotory ampullae without longitudinal streaks, only with lateral longitudinal folds or grooves.

17 (18). Submentum of labium hexagonal, with numerous, distinct, deep, groovelike longitudinal wrinkles. Found on grape. . . . . 9. **Teratoclytus** Zaitz.

18 (17). Submentum of labium square, without numerous groovelike longitudinal wrinkles.

19 (20). Head round, narrows anteriorly, not produced near antennal base; ocellus not submerged in alveolar depression, and without carinate elevation on sides. . . . . 10. **Paraclytus** Bat.

20 (19). Head does not narrow anteriorly, with parallel margins, appears laterally produced near antennal base; frontal side of ocellus appears submerged in alveolar depression, and with carinate reddish-rust elevation on sides. . . 11. **Aglaophis** Thoms.

Pupae

1 (12). Pronotum with scattered short or long, thick or thin setaceous (*Epiclytus*) spinules.

2 (9). Antennae flexed to sides, with apices directed backward.

3 (4). Abdominal tergite I with well-developed spinules. Paired medial spinules on abdominal tergites distinctly larger than other spinules. . . . . 1. **Xylotrechus** Chevr.

4 (3). Abdominal tergite I with minute, sometimes barely perceptible spinules or without them. Paired medial spinules on successive abdominal tergites not larger, not distinguishable from other spinules.

5 (6). Pronotum with very long lateral spinules, usually bent upward. . . . . 2. **Clytus** Laich.

6 (5). Pronotum with short lateral spinules that are not distinguishable from others.

7 (8). Abdominal tergite VII with 16 or more apical spinules forming distinct transverse row, and numerous spinules on disk forming cluster. Anterior half and sides of pronotal disk densely covered with straight spinules. . . . . 3. **Brachyclytus** Kr.

8 (7). Abdominal tergite VII with four to eight apical spinules in transverse row, several spinules on disk forming two transverse rows. Pronotum with minute, sparse, scattered spinules in anterior half of disk, and denser spinules laterally. . . . . 4. **Cyrtoclytus** Ganglb.

9 (2). Antennae flexed to sides, distally bent ventrad and forward.

10 (11). Pronotum with thin setaceous spinules. Antennae terminally bent ventrad with apices directed forward. . . 5. **Epiclytus** Gress.

11 (10). Pronotum with thick long and short scattered spinules. Antennae bent ventrad only distally. . . . . 6. **Plagionotus** Muls.

12 (1). Pronotum with stray or scattered bristles.

13 (16). Bristles on pronotum piliform, form dense transverse stripe medially, individual clusters laterally, and transverse stripe on anterior margin.

9 14 (15). Pronotum not oblong, i.e., length slightly more than width, rounded laterally, and sides not parallel. Antennae of female distally bent ventrad, of male very slightly directed forward. . . . . 7. **Chlorophorus** Chevr.

15 (14). Pronotum oblong, distinctly elongate, its length more than width, with almost parallel sides. Antennae of female arcuate, of male spiraled apically and extend far forward. . . . . : . . 8. **Rhaphuma** Pasc.

16 (13). Bristles on pronotum acicular, scattered; if form transverse stripe, then latter immediately behind middle; bristles lacking on anterior margin or only stray ones present and do not form transverse stripe here.

17 (18). Pronotum with wide group of bristles on inner side of posterior angles, located on sclerotized base, and with aristate transverse stripe behind middle. Antennae of male very long, in second half bent, looplike on inner side, and extend forward with apices adjoining forecoxae. . . . . . . 9. **Teratoclytus** Zaitz.

18 (17). Pronotum with stray bristles on inner side of posterior angles, not forming cluster here, with or without aristate transverse stripe behind middle. Antennae of male shorter, bent forward in second half, but do not reach anterior margin of forecoxae.

19 (20). Bristles on pronotum few, not forming dense transverse stripe medially. . . . . 10. **Paraclytus** Bat.

20 (19). Bristles on pronotum numerous, forming transverse stripe medially. . . . . 11. **Aglaophis** Thoms.

Genus *Xylotrechus* Chevr.

Chevrolat, 1860, *Ann. Soc. Entom. France*, 3, 8, 456; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 336–338; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 231: Linsley, 1964, *Cerambycidae of North America*, 22, 5, 104–107.

Adult: Readily identified by presence of longitudinal carinae on frons. Head retracted into prothorax almost up to eyes. Frons with broad sutures laterally (subgenus *Xylotrechus* s. str.) or parallel sides (subgenus *Xyloclytus* Reitt.). Frontal carinae close set or merge, considerably shifted toward back side [*X. pantherinus* (Sav.), *X. adspersus* (Gebl.)], or fused almost throughout length into single narrow belt [*X. antilope* (Schönh.)], or indistinct [*X. altaicus* (Gebl.)]. Sides of vertex with minutely punctate, sometimes sharply punctate sclerites (male) or without them, and with uniformly deep punctation (female). Antennae short, apices extend at most up to anterior third of elytra. Sides of pronotum rounded, disk convex, densely punctate; in many species with sculpture of transverse folds, especially in middle. Legs moderately long, femora nonclavate. First segment of hind tarsi much longer than two successive segments together.

Larva: In contrast to larvae of other genera of this tribe, characterized by complete or partial sclerotization of pronotal shield. Head retracted into prothorax over half or more its length, with one round or slightly oval, convex, hyaline ocellus near antennal base; frontal sutures indistinct, longitudinal epistomal sutures distinct [*X. altaicus* (Gebl.)] or not
10 visible. Prothorax with two sternal plates almost completely separated by hairy field. Thoracic legs lacking. Anterior third of pronotal disk with two transverse rectangular yellow spots, with deep broad or narrow white notch on anterior margin. Pronotal shield entirely sclerotized, densely covered with very minute brownish spinules, with rusty tinge [*X. pantherinus* (Sav.), *X. altaicus* (Gebl.)], or sclerotized only at base, pubescent, with brownish spinules, remainder matte white [*X. arvicola* (Oliv.)] or lustrous, and covered with longitudinal streaks [*X. antilope*

(Schönh.)]. Locomotory ampullae of abdomen sclerotized throughout surface [*X. rusticus* (L.), *X. ibex* (Gebl.)] or near to or predominantly on periphery, and without spinules on disk [*X. cuneipennis* Kr., *X. hircus* (Gebl.)], or with shagreen sculpture (*X. clarinus* Bat.).

Pupa: Readily identified by short, straight antennae flexed to sides, and arrangement of spinules on abdominal tergites. Head with broad longitudinal depression or almost flat between antennae. Posterior half of pronotum rounded or angular, broadens smoothly toward anterior end and narrows very abruptly posteriorly, with transverse narrow groove near posterior margin, with or without narrow constriction; disk predominantly in anterior half and sides with spinules or bristles, sometimes forming large groups. Abdominal tergites with spinules forming broad transverse stripe of large spinules in posterior half, which is medially interrupted, and transverse stripe of minute spinules in anterior half. One (*Xylotrechus* s. str.) or two (*Xyloclytus* Reitt.) contiguous larger dark spinules occur between these transverse stripes on disk of tergites immediately behind middle, along sides of longitudinal groove. These spinules are distinguishable from other spinules and form two longitudinal rows on abdomen. Tergite VII markedly elongate, narrows anteriorly, with large spinules on posterior margin bent forward, ungual, forming transverse row; two large spinules in front of former bend toward each other and also form transverse row; minute spinules in anterior half form clusters, transverse stripe, or transverse row.

The genus *Xylotrechus* Chevr. is represented in northern Asia by 19 species, of which three are distributed in Eurasia, three predominantly in Europe and the southern Urals, three in Siberia from the Urals or Ob' to the Pacific coast, seven east of Lake Baikal, in Ussuri-Primor'e region, of which two species (*X. mixtus* Plav. or *X. pavlovskii* Plav.) are known from individual specimens. Among the species of *Xylotrechus* Chevr. in northern Asia, *X. altaicus* (Gebl.) is ecologically associated with large plants, *X. arnoldi* Kost. with herbaceous plants, and the remaining species with deciduous trees.

The genus *Xylotrechus* Chevr. is Holarctic in origin and richest in species in Southeast Asia, partly in Japan, and in North America. About 50 species are known in Southeast Asia, 23 in Japan, and 22 in North America. However, in Japan only five species [*X. rusticus* (L.), *X. cuneipennis* Kr., *X. rufilius* Bat., and others] are common to the fauna of continental northern Asia, and all five are absent in North American fauna.

Type species: *Clytus sartorii* Chevrolat, 1860.

KEY TO SPECIES

Adult Insects

1 (32). Frons with broad median suture on each side (subgenus *Xylotrechus* s. str.). Frontal carinae distinct, protrudes sharply, usually smooth, and posteriorly bifurcate.

2 (7). Hairy cover on elytra forms mottled pattern, each spot with three to ten hairs.

3 (4). Posterior third of elytra with alveolate, longitudinally elongate spot. Pronotum oblong. Greater part of Eurasia. . . . . 1. **X. pantherinus** (Sav.).

4 (3). Posterior third of elytra without alveolate, longitudinally elongate spot. Pronotum transverse.

5 (6). Elytra with yellow spots. Northern Asia. . . . . 2. **X. adspersus** (Gebl.).

6 (5). Elytra entirely black, without yellow spots, with only grayish, light-colored hairy spots and thin bands. Palearctic. . . . . 3. **X. rusticus** (L.).

7 (2). Hairy cover on elytra uniform, continuous, not mottled.

8 (11). Elytra straw-yellow, with coffee tinge.

9 (10). Pronotum with pair of longitudinally elongate white hairy spots bulging outward on posterior slope. Elytra apically rounded. Frontal carinae broadly bifurcate posteriorly; space between them not less than space between carinae and frontal margin. Vertex without longitudinal carina. Northern Asia. . . . . 4. **X. hircus** (Gebl.).

10 (9). Pronotum without longitudinally elongate white hairy spots on posterior slope. Elytra apically truncate, with sharp elongate outer angle. Frontal carinae close set; space between them groovelike, half length of space between carinae and frontal margin. Vertex with well-developed longitudinal carina. Northern Asia. . . . . 5. **X. cuneipennis** Kr.

18 (8). Elytra black, blackish-brown, sometimes with rusty tinge.

12 (29). Pronotal disk without light-colored spots or at most with two small spots behind middle.

13 (28). Pronotum black or blackish-brown, in any case not red.

14 (25). Elytra markedly truncate on inner side at apex, not rounded.

15 (18). Outer angle at apex of elytra rounded, not produced in form of spur.

16 (17). Pronotum smoothly rounded laterally. Seventh to 10th antennal segments extend beyond elytral base. Europe, Central Asia up to coasts of Sea of Okhotsk and Sea of Japan. . . . . 6. **X. ibex** (Gebl.).

17 (16). Pronotum angularly produced beyond middle. Antennae shorter, only 11th segment extends beyond or up to elytral base. Southern Kuril Islands (Kunashir), Japan. . . . . 7. X. **clarinus** Bat.

18 (15). Outer angle of elytral apex not rounded, sharply produced in form of spur.

19 (24). Elytra without longitudinal white stripe at base on inner side of humeral tubercles.

20 (23). Elytra with narrow transverse bands of light-colored hairs, and distinct narrow transverse white humeral stripes.

12 21 (22). Frontal carinae well developed, their width not less or only slightly less than space between frontal carina and lateral margin of frons. Elytra narrow just slightly toward apex. Europe up to eastern Ural region. . . . . 8. X. **arvicola** (Oliv.).

22 (21). Frontal carinae thin, poorly developed, their width equal to half space between frontal carina and lateral margin of frons. Elytra narrow markedly toward apex. Northern Africa, Europe, Urals. . . . . 9. X. **antilope** (Schönh.).

23 (20). Elytra with broad transverse bands of light-colored hairs (space between bands almost not more than their width), and with broad diffuse white humeral fields. Southeast Asia, southern Ussuri-Primor'e region. . . . . 10. X. **polyzonus** (Fairm.).

24 (19). Elytra with longitudinal white stripe at base, on inner side of humeral tubercles. Ussuri-Primor'e region. . . . . 11. X. **mixtus** Plav.

25 (14). Elytra not truncate on inner side at apex, broadly rounded.

26 (27). Elytra black, with distinct narrow white transverse bands. Body length 8.0 to 14.0 mm. Europe, western Siberia up to Altai. . . . . 12. X. **capricornis** (Gebl.).

27 (26). Elytra with rusty tinge, with faint transverse bands. Body length up to 8.0 mm. Northern Kazakhstan. . . . . 13. X. **arnoldi** Kost.

28 (13). Pronotum red or cinnabar-red, sometimes slightly darkened only at anterior margin. Ussuri-Primor'e region, Japan. . . . . 14. X. **rufilius** Bat.

29 (12). Pronotal disk with four light-colored large hairy spots, two in anterior half and two in posterior half.

30 (31). Elytra truncate at apex. Hind femora extend beyond elytral apex. Ussuri-Primor'e region. . . . . 15. X. **pavlovskii** Plav.

31 (30). Elytra rounded at apex. Hind femora do not reach elytral apex. Ussuri-Primor'e region. . . . . . 16. X. **nadezhdae** Tsher., sp. n.

32 (1). Frons notched on each side, with parallel sides or broadens slightly towards front (subgenus *Xyloclytus* Reitt.). Frontal carinae faint, with large punctation.

33 (36). Elytra with highly pubescent, distinct yellowish transverse bands.

34 (35). Apex of elytra truncate, with spinelike produced angles. Northeast China, Korean Peninsula, Japan. . . . . 17. X. **chinensis** (Chevr.).

35 (34). Apex of elytra rounded; angles truncate, not produced nor spinelike. Japan, Kunashir Island. . . . . 18. X. **villioni** Vill.

36 (33). Elytra with slightly pubescent transverse bands. Northern Asia from the Urals to the Pacific coast. . . . 19. X. **altaicus** (Gebl.).

Larvae

1 (22). Gular plate light rust, markedly elongate or transverse. Prosternum posteriorly with glabrous rounded sclerite that does not extend forward beyond its middle. Found on deciduous trees.

13 2 (17). Pronotal shield entirely sclerotized, with minute tubercular spinules.

3 (8). Gular plate not elongate, transverse, its basal width more than length, markedly narrows apically.

4 (5). Spinescent field on dorsal locomotory ampullae in form of border around nonspinescent disk. Light-colored nonspinescent spot occupies almost entire disk of ampulla. Found on willow. . . . . 1. X. **pantherinus** (Sav.).

5 (4). Spinescent field on dorsal locomotory ampullae occupies large part or entire disk of ampullae.

6 (7). Disk of dorsal locomotory ampullae with small white nonspinescent spot. Found on willow. . . . 2. X. **adspersus** (Gebl.).

7 (6). Dorsal locomotory ampullae without white spots, entirely covered with brownish spinules. Found on birch, aspen, willow, and other trees. . . . . 3. X. **rusticus** (L.).

8 (3). Gular plate markedly elongate, oblong, its basal width much less than length; if larger, then dorsal locomotory ampullae entirely sclerotized.

9 (12). Gular plate oblong. Dorsal locomotory ampullae sclerotized only along periphery; middle or anterior half light colored, not sclerotized, leathery, shagreen.

10 (11). Dorsal locomotory ampullae sclerotized along periphery, with minute spinules, leathery, shagreen in middle. Found on birch. . . . . 4. X. **hircus** (Gebl.).

11 (10). Dorsal locomotory ampullae sclerotized only along posterior and inner margins (in region of longitudinal groove), in remaining part leathery, white, without spinules. Found on maple, hornbeam, oak, and other trees. . . . . . . 5. X. **cuneipennis** Kr.

12 (9). Gular plate short and transverse. Dorsal locomotory ampullae entirely sclerotized, and entirely covered with spinules imparting brownish tinge.

13 (16). Labrum without median longitudinal glabrous groove, entirely covered with spinules in anterior half. Sides and tip of abdomen covered with sparse light rusty hairs. Spiracles on sides of abdomen very broad and elongate, with light rusty border.

14 (15). Pronotal shield markedly produced at anterior angles, with two notches in anterior margin. Found on birch, elm, and other trees. . . . . 6. **X. ibex** (Gebl.).

15 (14). Pronotal shield not produced at anterior angles, without notches in anterior margin, and slopes gradually. . . . 7. **X. clarinus** Bat.

16 (13). Labrum with median longitudinal glabrous groove, in anterior half covered with bristles only along sides. Sides and tip of abdomen with very dense short rusty hairs. Spiracles on sides of abdomen very broad, only slightly elongate, with dark rusty border. Found on Maximovich poplar. . . . . 16. **X. nadezhdae** Tsher., sp. n.

17 (2). Pronotal shield sclerotized only at base, covered here with matte silvery sculpture or minute spinules in form of transverse stripe, on remaining surface leathery or leathery-shagreen.

18 (19). Pronotal shield without longitudinal wrinkles, smooth. Found on oak. . . . . 8. **X. arvicola** (Oliv.).

19 (18). Pronotal shield with deep longitudinal wrinkles.

20 (21). Pronotal shield with two slight notches in anterior margin, and
14 slightly produced forward at anterior angles. Gular plate without basal sclerotization. Found on oak. . . . . 9. **X. antilope** (Schönh.).

21 (20). Pronotal shield with two very distinct notches in anterior margin, and markedly produced at anterior angles. Gular plate with basal sclerotization forming brownish stripe that projects forward. Found on maple. . . . . 14. **X. rufilius** Bat.

22 (1). Gular plate dark brown or dark rusty, transverse, at least not oblong. Prosternum posteriorly with glabrous rounded or oblong sclerite, which extends forward beyond its middle, and completely divided by convex hairy field. Found on larch. . . . . 19. X. **altaicus** (Gebl.).

Pupae

1 (18). Abdominal tergites beyond middle of disk, along sides of longitudinal groove, between anterior and posterior transverse spinescent stripes, with one large dark spinule.

2 (9). Pronotum with narrow basal constriction, rarely without constriction; in latter case pronotal disk glabrous, only sides with sparse bristles.

3 (4). Almost entire surface of pronotum covered with stray and widely scattered short or straight spinules, without spinules only in middle part of posterior slope. . . . . 1. X. **pantherinus** (Sav.).

4 (3). Pronotal disk glabrous, covered with spinules or bristles only along periphery; if spinules present on disk, then arranged in groups.

5 (8). Anterior margin and sides of pronotum covered with spinules or bristles; pronotal disk glabrous.

6 (7). Greater part of pronotum glabrous, only sides, especially in anterior half, covered with bristles. . . . 2. X. **adspersus** (Gebl.).

7 (6). Pronotum along anterior margin and sides covered with sparse or straight aristate spinules. . . . . 3. X. **rusticus** (L.).

8 (5). Disk, sides, and base of pronotum covered with aristate spinules arranged in large clusters. . . . . 6. X. **ibex** (Gebl.).

9 (2). Pronotal base with or without perceptible constriction in latter case with spinules forming large clusters in anterior half.

10 (13). Spinules on abdominal tergites II to VI short, not more or only slightly longer than width at base.

11 (12). Spinules on pronotum acicular, apically pointed, and constitute general background in anterior half and sides of pronotum. . . . . 4. X. **hircus** (Gebl.).

12 (11). Spinules on pronotum not acicular, thick, apically not pointed or slightly pointed, often conical. . . . . . . 5. X. **cuneipennis** Kr.

13 (10). Spinules on abdominal tergites II to VI long, 2.0 times longer than width at base, rarely short. Pronotum covered with thin acicular or short acute spinules arranged in transverse stripes at anterior margin and in middle, or common stripe along periphery that is interrupted in middle of base.

14 (17). Abdominal tergite VII with four large spinules on posterior margin directed forward.

15 (16). Pronotum covered with short aristate spinules uniformly distri-
15 buted in anterior half and along sides; disk glabrous, lustrous
in posterior half. . . . . 8. X. **arvicola** (Oliv.).

16 (15). Pronotum covered with thin acicular spinules arranged in clusters, two near base, one in form of narrow transverse median stripe, one in form of broad transverse shield near anterior margin, and two each along sides (one in anterior half, the other in posterior half). . . . . 9. X. **antilope** (Schönh.).

17 (14). Abdominal tergite VII with 10 large spinules on posterior margin directed forward. . . . . 16. **X. nadezhdae** Tsher., sp. n.
18 (1). Abdominal tergites beyond middle of disk, along sides of longitudinal groove, with two adjacent sessile (paired) spinules between anterior and posterior transverse spinescent stripes. . . . . 19. **X. altaicus** (Gebl.).

1. **Xylotrechus pantherinus** (Sav.)

Savenius, 1825. In: Hummel's *Ess. Entom.*, vol. 4, p. 65 (*Clytus*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 346–348; Demelt, 1966, *Tierwelt Deutschlands*, 52, 2, 74; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed., pp. 31–32; Cherepanov and Cherepanova, 1975, *Zhuki-drovoseki ivovykh lesov Sibiri*, pp. 95–98.

Adult (Figure 1): Readily identified by typical pattern and mottled hairy cover on elytra. Head with dense punctation, white adherent hairs directed along sides of frontal carinae toward eyes, between carinae backward, in anterior third toward base of jaws, and on vertex toward midpoint. Frontal carinae distinct, fused toward front, rounded or angularly shifted on back side, with space between them distinctly more than orbital space between lateral margin of frons and frontal carina. Vertex flat, with well-developed or indistinct median longitudinal carina, in male its sides with densely punctate rounded sclerite, in female with similar punctation but not rounded sclerite. Eyes with shallow notch. Apices of antennae barely extend beyond base of elytra, with dense white hairs; 5th segment equal to 4th or slightly longer, much shorter than 3rd.

Pronotal disk convex, sides of pronotum broadly rounded, taper equally toward base and apex, with dense rugose punctation, and gray mottled hairy cover. Scutellum broad, broadly rounded posteriorly (almost at base), with very minute dense punctation, and with adherent hairs.

Elytra moderately elongate, in female sometimes broader, convex, with almost parallel sides, at apex obliquely pointed, with narrow angularly rounded outer angle and obtusely rounded inner, with very minute dense punctation, and mottled grayish-white hairy cover. Legs well proportioned; hind femora gradually thicken distally, barely reach posterior margin of third quarter of elytra (female) or conspicuously extend beyond it. Ventral surface of body with dense, uniform, grayish-white, compact hairy cover, consisting of long erect light rusty hairs. Body blackish-brown, antennae and legs with more rusty tinge. Pronotum with longitudinal hairy cover on sides, with two wide longitudinal stripes on disk interrupted by clearances into four wide hairy spots. Elytra blackish-brown, with light-colored rusty spots, with denser hairy cover. Hairs between spots mottled, each spot with three to seven hairs. One of these light-

16 colored spots (slightly obliquely elongate) in anterior third of disk, second (round) on side before midpoint, and third (round) on disk shifted closer to suture between first and second halves of elytra, slightly curved transverse band before posterior slope, and transversely elongate spot at apex (f. *typica*). Often crossband, apical spot along suture and on lateral margin fuse into longitudinally elongate alveolate spot occupying entire posterior half of elytra (ab. *apiceocellatus* Plav.). Sometimes crossband divided into two spots (ab. *moei* Thoms.), or anterior spots

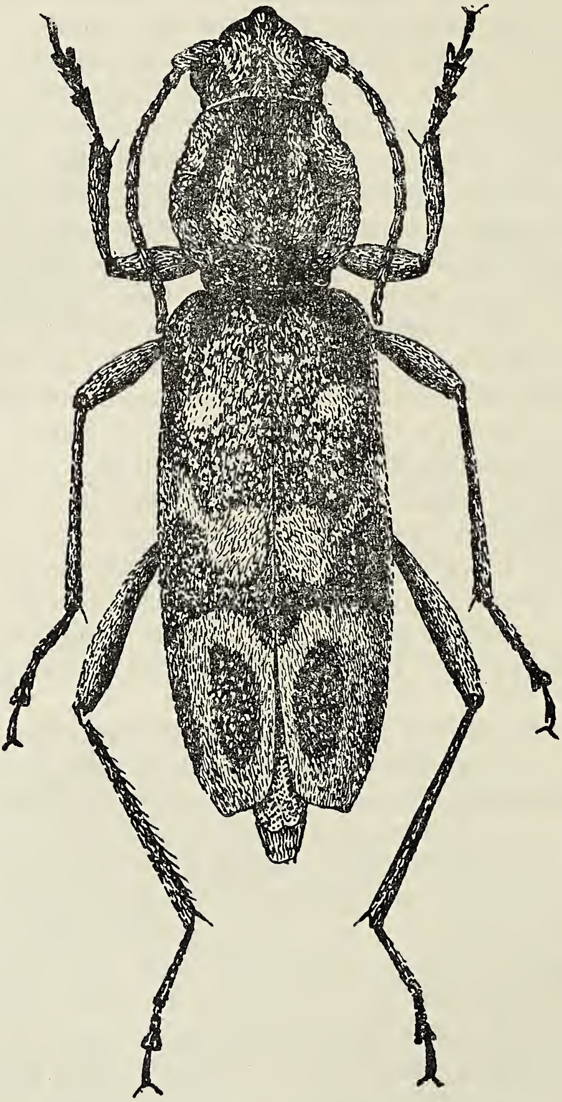
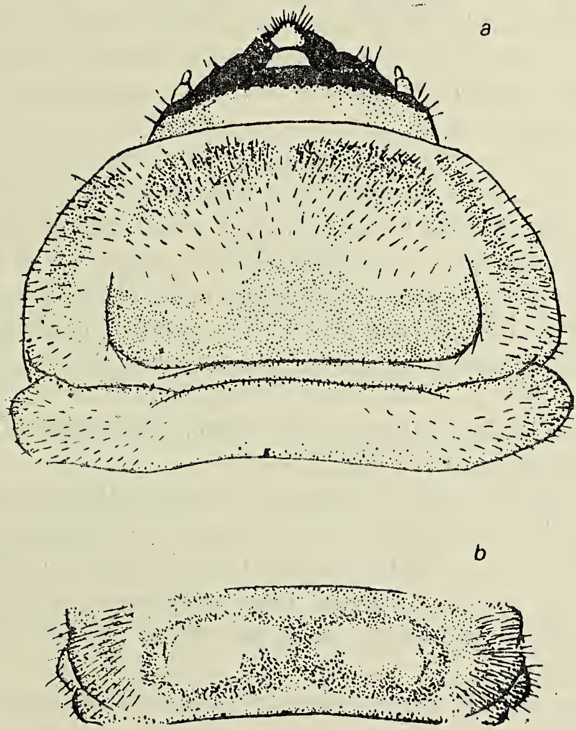


Figure 1. *Xylotrechus pantherinus* (Sav.), female.

fuse into two oblique bands in anterior half of elytra (ab. *jacovlevi* Sem.). Body length 10 to 16 mm.

Egg: White, elongate, narrows more toward posterior pole and less toward anterior, narrowly rounded at former and broadly at latter. Chorion smooth, with very thin nonalveolate structure only at poles, which is visible under high magnification. Length 1.8 mm, width 0.6 mm.

Larva (Figure 2): Characterized by almost straightly truncate pronotal shield, disk of dorsal locomotory ampullae not sclerotized laterally, and markedly narrow gular plate apically. Head narrowly rounded anteriorly. Epistoma notably convex, barely notched or almost straight at anterior margin near clypeus, with smooth dark brown border, fine transverse streaks only at anterior angles, and fused with parietals laterally; frontal sutures not visible, median longitudinal suture in form of short line apically. Hypostoma slightly convex, with narrow light rusty border on anterior margin, and distinct notch near inner angle. Gular plate narrows markedly toward front, apex 0.50 width at base, and light rusty at anterior margin. Anterior third of parietals brownish-rust, with



17 Figure 2. Larva of *Xylotrechus pantherinus* (Sav.).
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

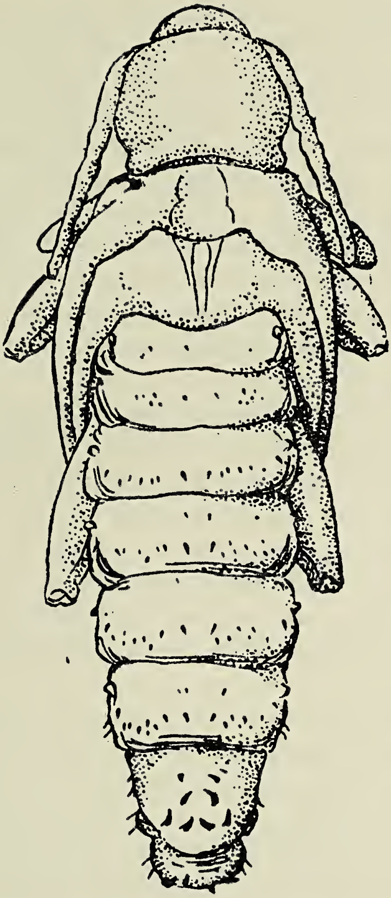
light longitudinal clearance near antennal base in middle with thin short hairs. Antennae long, slender; 2nd segment almost extends beyond anterior margin of cephalic capsule. Ocellus hyaline, convex, shifted downward toward antennal base, its width very slightly less than that of 1st
17 antennal segment. Clypeus trapezoid, its width 2.0 times length, lustrous. Labrum transversely oval, convex, its anterior half with dense bristles. Mandibles black, base reddish-brown, apex broadly rounded, with thin cultrate margin, outer side closer to base with transverse groove. Inner masticatory lobes of maxillae apically truncate and with sparse stray bristles. Maxillary palps slightly longer than inner lobes. Submentum of labium oblong, convex in middle, with deep longitudinal grooves laterally. Mentum almost square, anterior half broadens slightly, with long bristles laterally forming one group on each side.

Pronotum transversely oval, more rounded along anterior margin, 2.0 times wider than long, with two transversely elongate yellow spots in anterior third of disk, small notch in anterior margin, with longitudinally elongate yellow spot laterally, and disk with sparse erect hairs that are slightly denser, rusty, and adherent on sides. Pronotal shield barely convex, almost straightly truncate on anterior margin, not produced anteriorly in middle and at angles, with yellowish tinge, and with dense minute sclerotized spinules; whitish longitudinally elongate pits (punctures) present, of which five to six located near each anterior angle; laterally bound by long longitudinal grooves. Prosternum with sclero-
18 tized spinules at base forming broad transverse stripe and longitudinal stripe extending forward from the middle, round lustrous glabrous spot on eusternum laterally, and short rusty hairs along sides of disk.

Abdomen laterally with sparse minute hairs. Dorsal locomotory ampullae convex, anterior ones divided by common longitudinal groove, brownish-yellow sclerotized spinules along periphery, whitish leathery shagreen on disk, and with curved longitudinal fold on sides. Central locomotory ampullae analogous in structure. Body length of mature larvae 19 to 25 mm, width of head 2.5 mm.

Pupa (Figure 3): Body moderately elongate. Head narrows conspicuously anterior to antennae, flat on vertex, with smoothly rounded, lustrous occiput; frons slightly convex, frontal carinae in form of two brownish lines, contiguous toward front and medially widely concave on outer side. Antennae flexed to sides, with apices directed backward, adjoin midfemora.

Pronotum slightly oblong, anteriorly narrows slightly and smoothly. posteriorly abruptly, with narrow transverse groove near posterior margin; disk broadly convex, tubercularly raised medially near base, with stray minute aristate spinules throughout surface that resemble small sclerotized tubercles from which one bristle originates in each; glabrous



17 Figure 3. Pupa of *Xylotrechus pantherinus* (Sav.).

only in middle of posterior slope. Mesonotum oblong, lustrous, slightly convex, with broadly elongate shield posteriorly. Metanotum broad, in posterior half saddle shaped, compressed, in anterior half convex, with median longitudinal groove, smooth, without spinules. Hind femora extend distally beyond abdominal tergite IV.

Abdomen elongate, broadens slightly medially and narrows insignificantly terminally. Abdominal tergites more convex in posterior half, with common median longitudinal groove, with thin acute dark brown spinules directed backward in middle forming jumbled transverse rows or stripes (16 spinules per stripe); small spinules before middle (tergites IV to VI with transverse rows of four to six spinules per row). Abdominal tergite VII raised posteriorly, broadly rounded; posterior margin with four long, large, very sharp spinules directed forward forming transverse row; ahead of these, beyond middle, two similar incurved spinules from second transverse row; four minute, well separated spinules directed inward occur in anterior half. Tergite VIII broadly rounded posteriorly, with four small, forwardly directed spinules here. Valvifers of female hemispherical, adjacent, and slightly produced apically. Body length 13 to 18 mm, width of abdomen up to 4.0 mm.

Material: Collected from Altai, Tuva, Trans-Baikal region, and Ussuri-Primor'e region. Adult insects 15, larvae 72, pupae—one male and one female, larval exuviae with beetles from pupal cells six.

Distribution: Greater part of Europe, northern Asia. Found rather often in the Ubsunur basin, along banks of rivulets flowing from southern slopes of the Tannu-Ol' range.

Biology: Inhabits willow plantations. Ecologically associated with shrubs (*Salix caprea*, *S. fragilis*, *S. sibirica*, *S. xerophila*). Emergence of beetles observed end of June to mid-August. Beetles do not feed, lead cryptic mode of life, and do not appear on flowers. They emerge from wood with developed gonads. Ovaries of one female dissected after emergence from wood contained 30 mature eggs, of another 68. After emergence from pupal cells beetles fly to branches of willow inhabited by them, mate, and oviposit. They live on viable branches (1.8 to 8.5 cm thick) of willow.

19 Newly hatched larvae bore into branches, live under bark and in wood, make longitudinal galleries from downside upward, fill them with fine frass, hibernate twice, and pupate after second hibernation in June and July. In thick branches galleries are made under bark of willow in upper layer of wood, and in thin branches often along pith. Sometimes galleries made by various larvae fuse and form large cavities filled with frass. Length of gallery usually 19 to 40 cm and width 5.0 to 8.0 mm. Pupal cell constructed at end of gallery and exit into bark nibbled in upper margin. Length of pupal cell 15 to 33 mm, width 4.0 to 10.0 mm. Larva pupates in pupal cell with head upward. Pupae develop for about three weeks. Young beetles appear in June and July. Circular openings 3.5 to 6.0 mm in diameter are nibbled at surface of branches after six to eight days and beetles exit through them from pupal cell. One generation completed in two years (Table 1). Branches damaged by larvae usually wither. Records of 12 insects revealed: weight of larvae 89 to 348 mg, pupae 79 to 308 mg, and young beetles prior to emergence from wood 65.5 to 234.0 mg. We extracted 84 insects from willow branches in a forest. Not found on other trees.

2. **Xylotrechus adspersus** (Gebl.)

Gebler, 1830, *Ledebour Reise*, 2, 3, 181 (*Clytus*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 348–350; Cherepanov and Cherepanova, 1973,

Table 1. Periods of development of *Xylotrechus pantherinus* (Sav.)

Year of development	May	June	July	August	September	October
1st	L	LPA	PAE	AEL	EL	L
2nd	L	L	L	L	L	L
3rd	L	LPA	PAE	AEL	EL	L

Note: For explanation of abbreviations used here and elsewhere in the text, see p. 29 of Volume 1.

Nov. i maloizv. vidy fauny Sibiri, 6th ed., pp. 30–31; Cherepanov and Cherepanova, 1975, *Zhuki-drovoseki ivovykh lesov Sibiri*, pp. 92–95.

Adult (Figure 4): Readily identified by minute punctate pattern on elytra. Body comparatively thick. Head with dense minute punctation, gray or rusty-gray pubescence, with hairs directed toward vertex, between frontal sutures backward, along sides of frons and toward base of mandibles. Frontal carinae lustrous, sharply convex, widely separated toward back side, contiguous toward front but not fused. Space between carinae with dense coarse punctation, lustrous, almost glabrous, with only stray hairs. Vertex with thin median carina, sometimes barely perceptible, its sides with rounded, more sharply defined, fine punctate matte sclerite (male) or uniform punctation and without matte sclerite (female). Antennae short, thick; 8th or 9th segment extends beyond base of elytra; 2nd to 6th segments with dense adherent white hairs; apex of 7th segment with very short brownish hairs, finely punctate, matte.

Pronotum distinctly transversely convex, beyond middle broadens angularly (male) or rounded in middle (female); anterior and posterior margins with narrow, smooth, sometimes distinctly shifted border, and dense transversely elongate punctation forming fine transverse fold, densely covered with adherent gray or grayish-yellow hairs that form two longitudinal stripes or four spots on disk, and one broad longitudinal 20 stripe on each side. Scutellum broad, flat, anteriorly semicircular, with dense fine punctation and adherent hairs.

Elytra broad, convex, with parallel sides, angularly rounded at apex, with very fine dense punctation in which short adherent yellowish-gray hairs located. Hind femora thicken gradually toward back side, barely reach or even do not reach posterior slope of elytra. Body ventrally with yellowish-gray, compactly adherent or sparse hairy cover, with thin, slightly erect, light-colored hairs. Body black or blackish-brown. Legs black, tarsi, and sometimes tibiae with rusty tinge. First half of antennae light colored, rusty; region of 2nd to 6th segments with dense white hairy cover, second half dark brown or black, without white hairy cover. Elytra black, with brownish tinge, with prominent yellowish spots; one spot on base near scutellum, another obliquely elongate, bandlike, to-

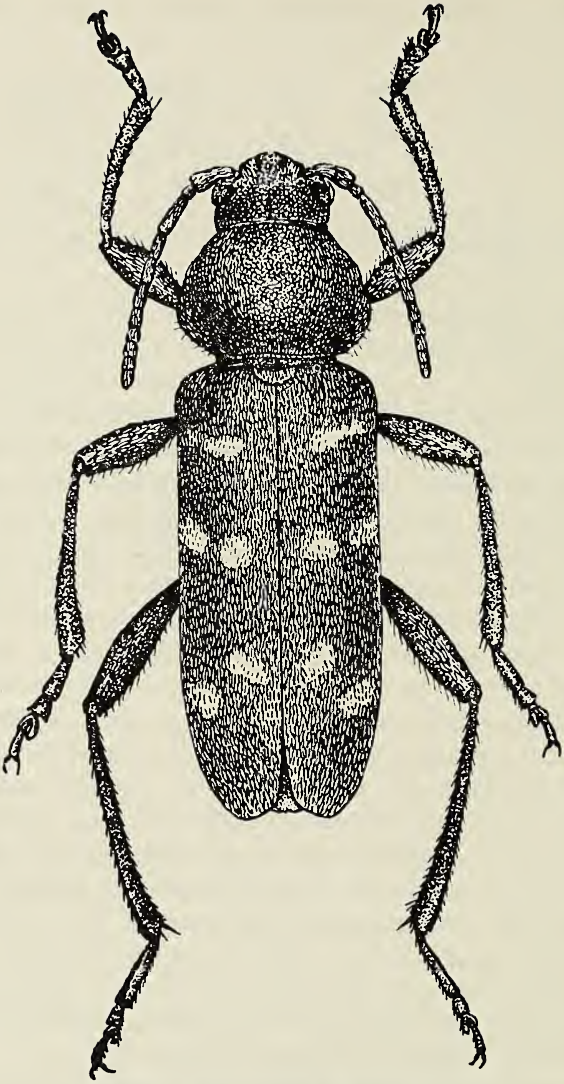


Figure 4. *Xylotrechus adspersus* (Gebl.).

ward shoulder in anterior third, two large spots arranged in transverse row before middle, and two spots (one large lateral, another crescentoid near suture) before posterior slope of elytra (f. *typica*). Sometimes posterior spots fuse and form crossband (ab. *gebleri* Plav.), or band in anterior third reduced to small spot (ab. *decemmaculatus* Pic); sometimes spot near scutellum absent (ab. *gluchichi* Plav.). Body length 11 to 17 mm.

Egg: White, oblong, rounded at poles, narrower at posterior pole. Chorion with minute, barely perceptible, silvery sculpture. Length 1.8 to 2.0 mm, width 0.6 mm.

Larva (Figure 5): Readily distinguished from *X. pantherinus* (Sav.) and *X. rusticus* (L.), by structure of gular plate and locomotory ampullae. Head narrowly rounded anteriorly, with half its length retracted into prothorax. Epistoma slightly convex, anterior margin straight, with distinct dark brown, smooth, and comparatively wide border behind which short light-colored setaceous hairs from two unequal transverse rows, without visible frontal sutures laterally, and with indistinct median suture. Hypostoma flat, with parallel sides or slightly divergent sutures
21 toward front, with narrowly angular or straight anterior outer angles, diffuse rusty border along anterior margin, and thin transverse wrinkles in anterior half. Gular plate oblong, convex, with lateral notches along anterior margin, anterior angles produced forward, and rusty or pale brownish tinge.

Parietals with dark brown border along anterior margin, with diffuse rusty tone toward back side (immediately behind ocellus) on lower side,

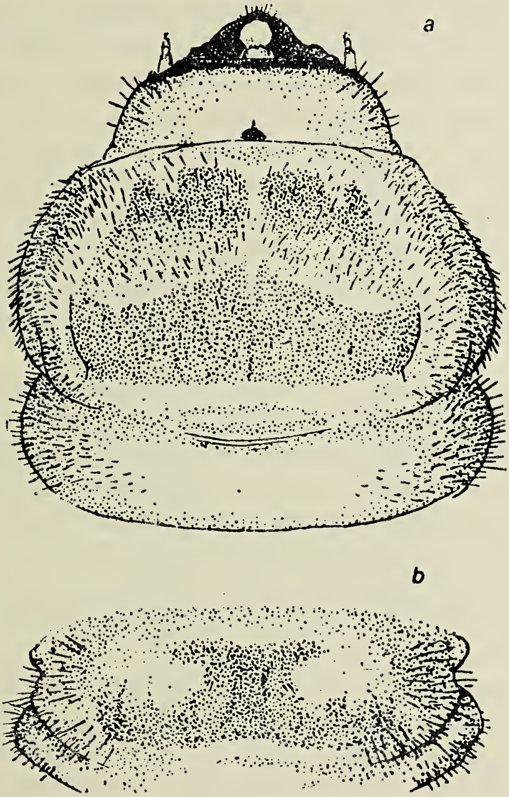


Figure 5. Larva of *Xylotrechus adspersus* (Gebl.).
a—head and pronotum; b—abdominal tergite
with dorsal locomotory ampulla.

and with rusty or grayish-rust hairs in anterior half, among which group of hairs near epistoma in region of white clearance with sclerotized border at base in some specimens. Clypeus broad, trapezoid, and notably elongote at base. Labrum transverse, broadly rounded anteriorly, thick, with numerous short light rusty bristles in anterior half, narrows slightly at base, glabrous with brownish tinge. Mandibles massive, with transverse outer groove near base, broad median longitudinal depression, black, dark red at base, with elongate, thin, sometimes slightly rusty, broadly rounded cultrate mesal surface. Inner masticatory lobes of maxillae long, their length more than width, with white rounded apex, and sparse light gray bristles. Maxillary palps barely extend beyond apex of inner lobes. Labial submentum barely wider than long, with parallel sides, scapularly rounded laterally toward front, and with three longitudinal convex lobes. Submentum indistinctly transverse, narrows slightly
22 in anterior half, broadens smoothly at base, with coarse bristles forming one tuft on each side.

Pronotum narrowly rounded anteriorly, broadly rounded along anterior margin, with rusty transverse spots in anterior half (separated by narrow white median clearance and with deep notch in anterior margin), with lustrous, glabrous, rusty longitudinal streak laterally with hairs directed backward, and on disk with short, erect, even-toned rusty hairs. Pronotal shield without rusty hairs, entirely sclerotized, with minute spinules, smoothly rounded and slightly produced forward in middle of anterior margin, with barely produced anterior angles, longitudinally elongate white alveolate dots, and laterally bound by short longitudinal grooves. Alar lobes near these grooves sclerotized, with minute brownish spinules.

Abdomen with not very dense light-colored hairs laterally, before and behind locomotory ampullae glabrous, without hairs. Dorsal locomotory ampullae quite convex, sclerotized, with minute spinules imparting brownish tinge; only on disk, closer to anterolateral margin, with whitish spot, divided in middle by common longitudinal groove; and laterally with longitudinally curved and sometimes deep fold. Ventral locomotory ampullae transversely elongate, sides with alveolor, sometimes radial depression, or with longitudinal groovelike fold. Length of mature larvae 20 to 25 mm, width of head 3.5 mm.

Pupa (Figure 6): Body stocky, comparatively short. Head short, narrows slightly before antennae. Frons anteriorly broad, transversely convex, with widely separated carinae in mature pupa resembling short chocolate-brown longitudinal stripes. Vertex notably depressed, occiput smoothly rounded. Clypeus and labrum coarsely and transversely rugose. Antennae short, thick, with apices extending only up to foretibiae.

Pronotum broadens angularly behind middle, abruptly toward base; gradually narrows anteriorly, without constriction at base, slopes smoothly toward posterior margin, broadly convex on disk, with barely perceptible transverse striation, glabrous on disk, with well-separated streaks on sides, especially in anterior half. Mesonotum slightly longer than wide, convex, glabrous, with small constriction in middle, and broadly rounded posteriorly. Metanotum transverse, broad, convex on disk, notably depressed laterally in posterior half, with median longitudinal groove, weak transverse pattern, glabrous.

Abdomen broadens in region of segments III to V, narrows less anteriorly, more posteriorly. Abdominal tergites slightly convex in posterior half; tergite I glabrous, without spinules; tergites II with short thin spinules forming unequal transverse row; tergites III to VI with two unpaired mixed transverse rows of spinules. Two of these spinules in anterior row paramedial; larger, sharp, ungual, bent backward, and appear to form two prominent longitudinal rows on general bockground of abdomen along both sides of median line. Tergite VII broadens anteriorly, rounded posteriorly, convex on disk, with minute spinules before mid-

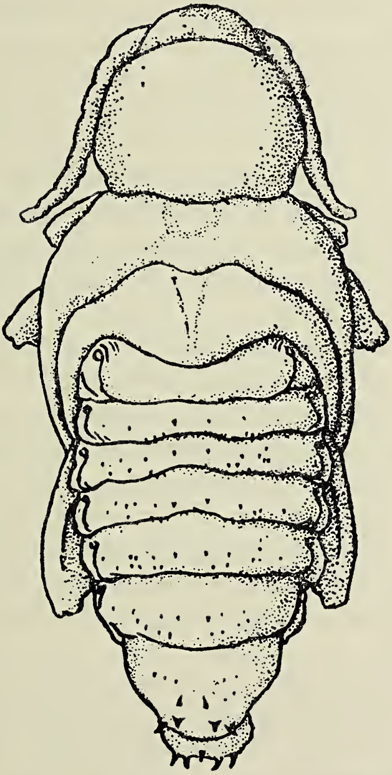


Figure 6. Pupa of *Xylotrechus adspersus* (Gebl.).

point forming transverse row, two large ungual spinules behind midpoint bent forward constituting second transverse row, and four large spinules near posterior end, also bent forward, forming third transverse row. Tergite VIII transverse, broadly rounded posteriorly, with five spinules forming transverse row, of which two on sides ungual, bent forward, and one in middle straight, subulate. Body length 14 mm, width of abdomen 4.0 mm.

23 *Material*: Collected in Altai, Tuva, Ussuri-Primor'e region, and Sakhalin Islands. Adult insects 18, larvae 38, pupa—one male, larval exuviae with beetles from pupal cells five.

Distribution: Siberia from Altai, Ob' to Pacific coast, including Sakhalin, and north up to Yakutia, in the south found in northern Mongolia; northern China, and north of the Korean Peninsula.

Biology: Inhabits willow plantations. Ecologically associated with willows and *Chosenia arbutifolia.* Emergence of beetles observed from June to July. During period of reproduction beetles found on trunks and shoots of viable willows, where mating takes place and eggs are laid in slit of bark singly or, rarely in batches of two to five. One female can lay more than 60 eggs.

Larvae appear mainly in July and August. Initially they live under bark, thereafter bore into wood, make longitudinal galleries, and fill their entire length with compact frass. Hibernate, at least for two years. Last instar larva makes pupal cell along trunk at end of gallery in upper layer of wood, with falcate exit in bark. Length of pupal cell 25 to 30 mm, width 7.0 to 10.0 mm. Larva pupates with head toward exit. Primordial thoracic legs appear in larva before pupation in form of caruncles, small lateral lobes appear on meso- and metathorax. Pupae found from second half of May to mid-July. Development continues for about three weeks at 13.6 to 18.9°C.

Young beetles begin to emerge from pupae in the second half of June and continue up to mid-July. Beetles make round openings 4.0 to 6.0 mm in diameter at surface of bark and exit from pupal cell through them. Ovaries of one female dissected four days after emergence from wood contained 40 fully developed large eggs and 26 small ones. Beetles start mating soon after emergence from wood. Cycle of development from egg to adult completed in two years. Considerable variability observed in weight. For example, eight larvae before pupation weighed 61 to 444 mg, pupae 53 to 381 mg, and young beetles before emergence from wood 33 to 295 mg.

This species damages willow and *Chosenia* plantations in flood-plains and along river banks. We collected 56 insects from willow forests. Not found on other trees. Rarely, found together with *Aromia moschata* (L.) and *Saperda similis* Laich.

3. **Xylotrechus rusticus** (L.)

Linnaeus, 1758, *Syst. Nat.*, 10th ed., p. 398 (*Cerambyx*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 350–354; Demelt, 1966, *Tierwelt Deutschlands*, 52, 2, 74–75; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed., pp. 35–37; Cherepanov and Cherepanova. 1975, *Zhuki-drovoseki ivovykh lesov Sibiri*, pp. 99–102.

Adult (Figure 7): Differs from *X. adspersus* (Gebl.) in less shifted frontal carinae that fuse toward front, monochromatic elytra, and other characters. Head with dense minute uneven punctation, laterally frons with dense white and compact adherent hairs, forming two longitudinal stripes reaching posterior margin of antennal pit (male) or almost up to occiput. Frontal carinae highly convex, slightly shifted (distance between them not more or slightly more than distance between frontal carina and lateral margin of frons), fuse toward front and here covered with uneven sparse dots. Vertex of female with even dense punctation, of 24 male with rounded, matte, minutely and densely punctate sclerites laterally. Antennae comparatively slender, extend beyond base of elytra by 7th to 8th (male) or 9th to 10th (female) segments, and sparsely covered with gray adherent hairs.

Pronotum transverse, broadens angularly or roundly behind middle (male) or medial part, narrows gradually posteriorly but more abruptly anteriorly, posterior margin with fairly and anterior margin distinctly smooth border; disk highly convex, with dense coarse punctation forming transverse folds that are larger in middle, and here with longitudinal tubercular elevation, with lateral longitudinal dents; covered with white adherent hairy coat, on disk forming two longitudinal stripes or four spots (of which anterior spots usually longitudinally elongate) and one broad stripe on each side. Side of pronotum with long, thin, light-colored, erect hairs in posterior half. Scutellum transverse, broad, smoothly rounded posteriorly, with dense punctation, and grayish or grayish-brown hairs.

Elytra convex, narrow slightly toward apex, apically obliquely truncate or obtuse, with dense rugulose punctation, covered with brownish-rust and white hairs forming white spots and transverse bands characteristic of this species. Hind femora only reach posterior slope of elytra. Body ventrally with white, not very dense hairy coat consisting of light-colored erect thin hairs. Body black, antennae and legs often with rusty tinge, tarsi usually light rusty. Elytra dark brown or black, with white and readily changeable hairy pattern consisting of three thin transverse bands: one, straighter, in anterior third; second zigzag before middle; and third curving forward in posterior third of elytra (f. *typica*). Sometimes only widely separated minute white spots remain of this pattern (ab. *subuniformis* Pic) or only one spot in middle (ab. *uniformis* Reitt.); some-

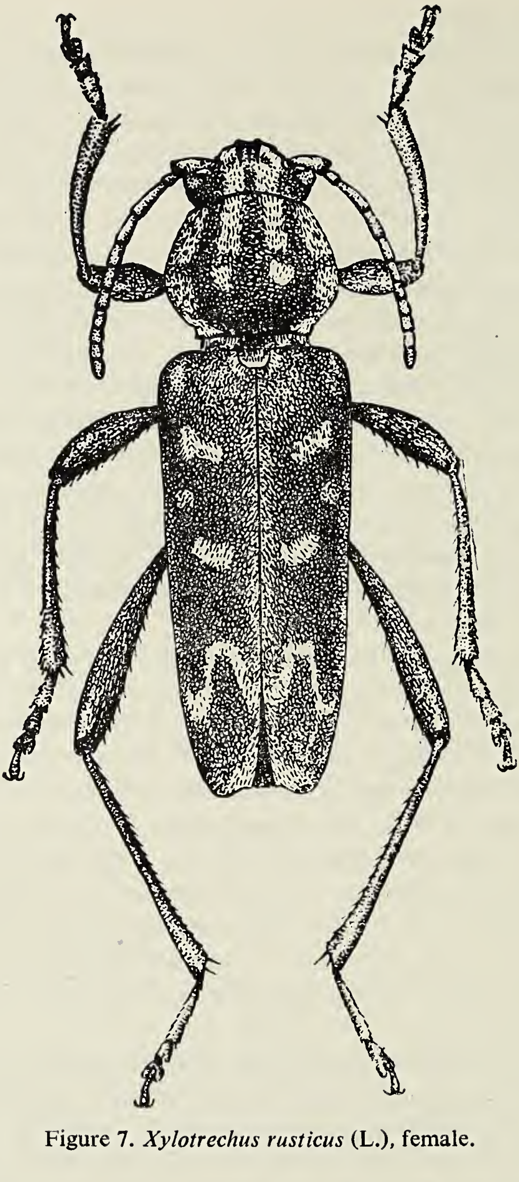


Figure 7. *Xylotrechus rusticus* (L.), female.

times elytra with yellowish tinge. Legs with lighter rusty tinge (ab. *heroicus* Plav.). Body length 8.0 to 21.0 mm.

Egg: White, moderately oblong, narrows gradually toward posterior pole, more broadly rounded at one pole (anterior) and narrow at the other (posterior). Chorion smooth, hyaline, translucent, sometimes with minute sculpture only at poles. Length 1.5 to 1.9 mm, width 0.5 to 0.7 mm.

Larva (Figure 8): Differs from other species of this genus in continuous sclerotization of locomotory ampullae of abdomen, presence of bristles in anterior half, and short, very dense hairy cover of prosternum. Body comparatively thick. Half of head retracted into prothorax. Epistoma with collarlike dark brown border along anterior margin, which slopes roundly toward front, with paired deep aristate processes medially and laterally on posterior margin, divided by indistinct median longitudinal suture, and fused laterally with parietals. Hypostoma flat, with parallel sides, straight outer anterior angles, and dark rusty border on anterior margin; border broad near inner angles of sclerites, to which outer lobes of labial submentum attached. Gular plate broad, broadens markedly toward base, with straight or slightly notched anterior margin with dark rusty border.

Parietals on anterior margin below antennae with dark brown border, with brownish diffuse tinge behind ocellus and here covered with sparse thin light-colored hairs. Antennae short, slender, barely extend distally beyond anterior margin of cephalic capsule. Ocellus near antennal base

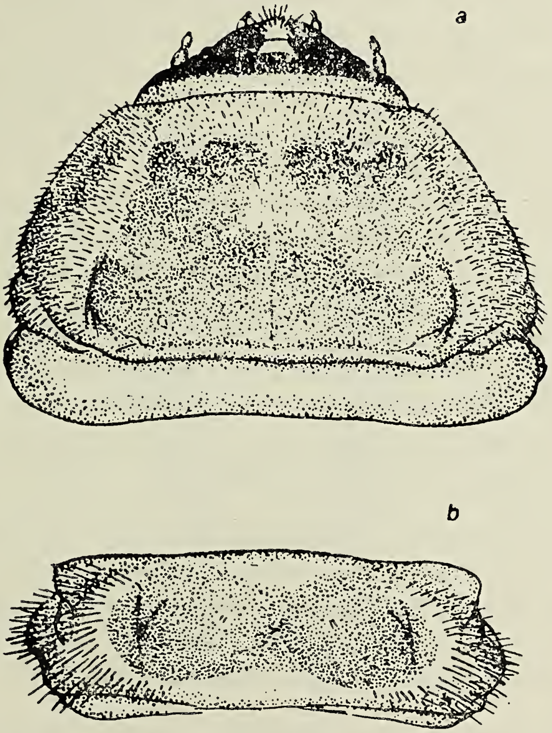


Figure 8. Larva of *Xylotrechus rusticus* (L.).
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

hyaline, about 0.33 diameter of 1st antennal segment. Clypeus broad, trapezoid, broadly produced at base, with brownish or whitish tinge. Labrum convex, narrows toward base, rounded apically, glabrous on
26 disk, with short rusty bristles along margin. Mandibles black, matte on outer side, with broad notch in middle near base. Inner masticatory lobes of maxillae slightly longer than wide, obliquely truncate apically, with produced inner angle, and coarse bristles near outer rounded angle. Labial submentum slightly transverse, with angles projecting forward, with flattened and broader median longitudinal lobes. Mentum transverse, with broad constriction at base, more convex medially along sides and here with dense thick bristles forming one cluster on each side.

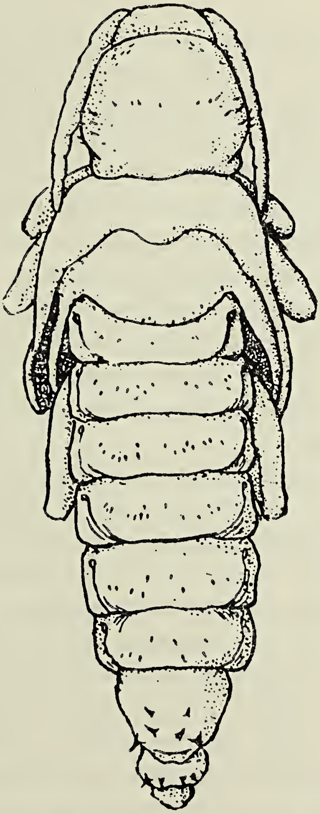
Pronotum slopes toward head, rounded on sides, with two transverse rectangular rusty spots in anterior third interconnected by broad white clearance, sides with glabrous lustrous yellowish spot, disk ahead of shield with erect hairs and sides with adherent short rusty hairs directed backward. Pronotal shield rusty, with dense minute spinules, sparse longitudinal whitish streaks or alveolar dots, two constrictions at anterior margin, produced in middle and at anterior angles, on sides bound by short longitudinal grooves. Alar lobes distinctly sclerotized, with minute spinules. Prosternum with dense short rusty hairs on disk and sides, with glabrous lustrous sclerites in posterior half along sides of median line that are divided almost up to posterior margin by dense hairy field, and covered with dense minute tubercular spinules at posterior border and in space between glabrous sclerites.

Abdomen narrows slightly at tip, sides with short rusty hairs. Dorsal locomotory ampullae entirely covered with dense, minute, brownish, sclerotized spinules, without white spots, anterior half with stray short bristles, medially divided by common and not very broad longitudinal groove, sides with longitudinal fold that curves outward. Ventral locomotory ampullae less convex, with two longitudinal radial folds overlapping each other, anterior one on inner and posterior on outer side, with short bristles in anterior half but none in posterior half. Body length of last-instar larva 23 to 29 mm, width of head 3.2 to 3.6 mm.

Pupa (Figure 9): Differs well from other species of *Xylotrechus* Chevr. in presence of somewhat large spinules anteriorly and laterally on pronotum. Head slightly convex between antennae, with median longitudinal depression, slightly flattened on vertex, and broadly rounded on occiput. Frons transversely rugulose, clypeus and labrum rugose. Antennae short, thick, flexed to sides, and extend only beyond distal end of forefemora.

Pronotum broadens behind middle, narrows gradually anteriorly, abruptly posteriorly, with narrow transverse groove near posterior margin, glabrous in posterior half of disk, without spinules, more convex, with barely protruding transverse streaks, with longitudinal dents along sides here, with sparse aristate dark brown spinules along periphery of anterior margin and on sides, which bend backward in posterior half and inward on sides. Mesonotum oblong, transversely rugose, with groove-like dent behind middle, slightly elongate posteriorly, depressed at scutellar apex. Metanotum convex, broad, with transverse pattern, and median longitudinal groove along sides, in posterior half with triangular dent.

Abdomen fairly elongate, narrows slightly toward anterior end and gradually but more so toward posterior end, with common dorsomedian longitudinal groove. Abdominal tergites convex, with spinules on pro-
27 duced leathery base, of which six to eight form transverse row on posterior margin, two larger incurved spinules constitute transverse row immediately behind middle, and three to five spinules form transverse row near anterior margin. Tergite VII broadly rounded posteriorly, posterior margin usually with four, rarely with three or five large ungual



25 Figure 9. Pupa of *Xylotrechus rusticus* (L.).

bristles bent forward; two large spinules immediately behind middle bent inward and slightly forward; four to seven spinules in middle, closer to anterior margin, bent inward and backward. These large spinules usually constitute two paramedial groups. Tergite VIII transverse, broadly rounded posteriorly, with four to five spinules on posterior margin that bent forward. Valvifers of female large, adjacent, broadly rounded, with distinctly demarcated round apical tubercle. Body length 14 to 20 mm, width of abdomen up to 4.0 mm.

Material: Collected in western Siberia, including Ural region, Altai, Tuva, eastern Siberia, including Yakutia, Baikal region, Buryat and Ussuri-Primor'e region. Adult insects 804, larvae 584, pupae—six males, 11 females. A large number of larvae were obtained from eggs laid by beetles in the laboratory.

Distribution: Eurasia from the Atlantic to Pacific Ocean, including Sakhalin and Japan, from Scandinavia, northern Ural, Yakutia, Chukchi to the Mediterranean region, Turkey, Iran, Trans-Caucasus, northern Kazakhstan, Altai, Mongolia, northern China, and north of the Korean Peninsula.

Biology: Lives in deciduous tree plantations; compared to other species of this genus, has a wider range of host plants. Beetles are found from end of May to early September. During systematic collections in the environs of Lake Telets and in Salair 533 beetles were collected, of which 0.3% were found at the end of May, 43.6% in June, 51.4% in July, 4.2% in August, and 0.5% at the beginning of September. Beetles are not found on flowers. After emergence they fly to weak, desiccated or freshly fallen trees, mate, and oviposit. Eggs are deposited in bark crevices or glued to the smooth surface. Mainly lives on trunks or thick shoots of poplar, aspen, birch, willow, linden, and other deciduous trees. One female can lay a very large number of eggs during her lifetime. Ovaries of one female dissected soon after emergence from wood contained 108 mature eggs.

Larvae hatch in forests 19 to 26 days after oviposition. They bore into bark, initially cut a small strip under it, then make a longitudinal gallery impressed on alburnum. Larvae of middle age penetrate deep into wood, continue to make longitudinal or transverse galleries, and fill them with frass. They construct a pupal cell in the upper layer of wood at the end of the gallery. A layer of wood up to 2.0 mm thick remains between the anterior end of the pupal cell and the bark. Length of pupal cell 22 to 30 mm, width 6.0 to 8.0 mm. Pupation begins after second hibernation in early May and terminates in July. First pupae found May 2nd. Pupal development continues for about three weeks, rarely up to four weeks. Young females appear at end of May, in June, and beginning of July, remaining in pupal cell for seven to ten days, during which time ovaries mature. Mature beetles cut circular openings 4.0 to 7.0 mm in diameter at surface of trunk and emerge through them. Generation completed in two years.

Insect weight decreases significantly during metamorphosis. For example, the weight of two larvae before pupation was 236 mg (100%), weight of pupae developed from them 214 mg (90%), and of adults emerging
28 from them 170 mg (72.3%). Total reduction in weight during metamorphosis 27.7%. However, the weight of individual insects in a given population of this species varies considerably. Both large and small insects are found. The weight range recorded for 23 individuals was: larvae before pupation 35 to 386 mg, pupae 30 to 285 mg, and young beetles before emergence from pupal cell 25 to 205 mg.

Xylotrechus rusticus (L.) often lives on birch and willows, rarely on other trees. We extracted 580 insects from wood of forest trees: 399 from birch, 109 from aspen, 32 from willow, 36 from poplar, two from mountain ash, one from maple, and one from linden. Sometimes *Acanthoderes clavipes* Schr., *Saperda perforata* Pall., and other species were also found together with this one.

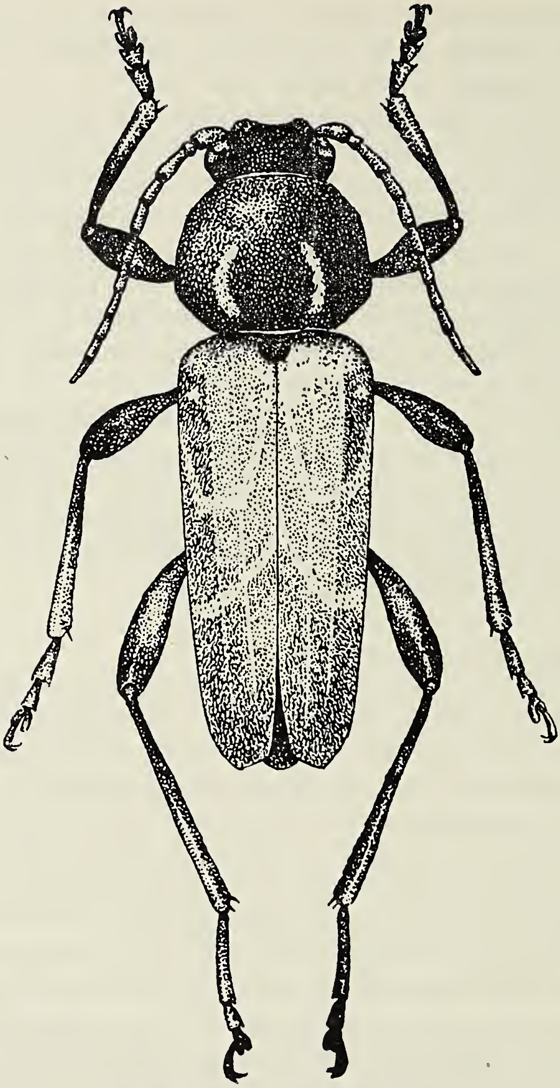
4. **Xylotrechus hircus** (Gebl.)

Gebler, 1825, In: Hummel's *Ess. Entom.*, vol. 4, p. 54 (*Clytus*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 9, 355–358; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed., pp. 34–35.

Adult (Figure 10): Differs well from other species in straw-yellow color of elytra, presence of two longitudinal hairy white stripes near posterior margin of pronotum, and frontal carinae more contiguous, almost fused in anterior half. Head with dense punctation, occiput with sparse punctation, sparse and short brownish hairs. Frontal carinae contiguous, distance between them not more than space between lateral margin of frons and frontal carina, fused in anterior half, space between carinae here convex, with large punctation. Vertex with dense punctation, without median longitudinal carina, in male with triangular, finely punctate, matte sclerite laterally, with its apex directed forward. Antennae comparatively slender, 8th to 9th segments extend beyond base of elytra, with short adherent hairs.

Pronotum laterally rounded, its length not more than medial width, uniformly convex, appears slightly flattened only on disk, with fine dense punctation, adherent and thin erect hairs, anterior and posterior margin with thin, slightly turned smooth edge. Scutellum flat, broad, almost
29 semicircular, with dense punctation, and brownish adherent hairs.

Elytra not very elongate, narrow slightly posteriorly, slightly convex, entirely rounded apically, with dense very minute adherent hairs. Hind femora reach (male) or slightly short of elytral apices. Body ventrally

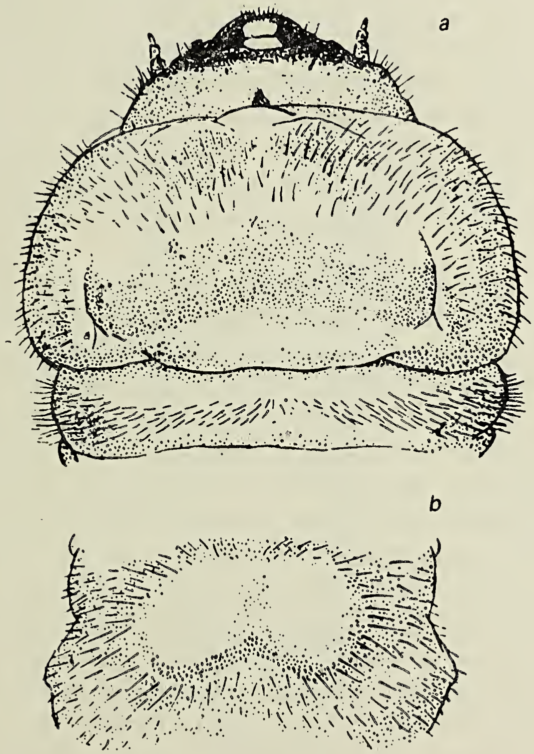


28 Figure 10. *Xylotrechus hircus* (Gebl.).

with long, thin, erect or semiadherent, silvery-brown hairs; abdominal sternites I to II rarely with white hairy border on posterior margin. Body black, ventral surface of abdomen or entire body with rusty, straw-brown, or chestnut tone. Pronotum in posterior half with two longitudinal, slightly curved, white hairy stripes toward outer side (hairs here directed inward). Elytra light brown with straw-yellow tinge (especially in anterior half), with two narrow white crossbands, one before middle extends along suture almost up to scutellum and along side toward humeral tubercle, second behind middle directed obliquely away from suture backward toward lateral margin. Both bands narrow, irregular, and easily rubbed off. Antennae rusty-brown. Legs dark brown or black, femoral bases red (f. *typica*); sometimes legs black throughout length (ab. *unicoloripes* Plav.). Body length 7.0 to 17.0 mm.

Egg: White, rounded at anterior pole, pointed at posterior pole. Chorion smooth, hyaline, transparent. Length 1.8 mm, width 0.6 mm.

Larva (Figure 11): Characterized by incomplete sclerotization of locomotory ampullae of abdomen, presence of broad spinescent sclerotized field at base of prothorax, and narrow gular plate. Head rounded, narrows toward front. Epistoma convex in anterior half, slightly depressed at apex, with narrow, barely perceptible notch in anterior margin before clypeus, with rusty-brown border, behind which very short and thin hairs form transverse row. Frontal sutures not visible, median epistomal suture lacking. Hypostoma flat, with parallel sides, sometimes



30 Figure 11. Larva of *Xylotrechus hircus* (Gebl.).
a—head and pronotum; b—abdominal tergite
with dorsal locomotory ampulla.

seems to narrow basally, with brownish or rusty diffuse border on anterior margin. Gular plate longitudinal, with brownish tinge. Parietals rusty-brown in anterior half, without whitish patch near ocellus, with light-colored thin hairs forming median transverse stripe. Antennae long, slender, extend far beyond anterior margin of cephalic capsule; 2nd segment barely shorter than 3rd. Ocelli very small, hyaline, convex, round, and 0.33 width of 1st antennal segment. Clypeus trapezoid, 2.0 times wider than long, lustrous, translucent. Labrum convex, narrows slightly basally, narrowly rounded at anterior margin, with short light-colored bristles along margins. Mandibles black or black with rusty tinge, with short longitudinal depression on outer side near base. Inner masticatory lobes of maxillae slightly longer than wide, brownish, whitish at apex, here with short light-colored bristles. Maxillary palps comparatively long, extend far beyond apex of inner lobes.

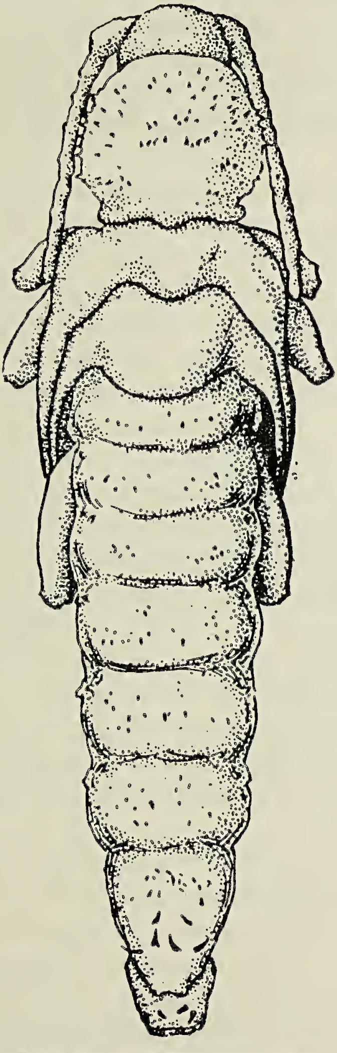
Pronotum 2.0 or 2.5 times wider than long, anterior third with transverse yellow, not very broad spots and lustrous yellowish, longitudinally elongate, glabrous spot laterally; short erect hairs located in front of scutellum; hairs in region of yellow transverse spots longer, sides with adherent rusty hairs. Pronotal shield moderately convex, hyaline, with yellowish-rust tinge, dense minute rusty spinules and white longitudinal streaks. Prosternum with dense uniform rusty hairs, disk behind middle
30 (eusternum) with two small, rounded, white, glabrous sclerites separated by broad hairy field; posterior third (sternellum) sclerotized, with dense minute spinules forming continuous field that extends to pleurosternites.

Abdomen with barely perceptible, very short, sparse light-colored hairs. Dorsal locomotory ampullae slightly convex, divided by common median longitudinal groove, posterior margin and region of groove, especially posterior half, yellowish-brown, with minute brownish spinules visible only under high magnification; disk and anterior half white, leathery, shagreen, without spinules, and sides with curved longitudinal folds. Ventral locomotory ampullae white, shagreen, posterior half and median longitudinal groove with brownish spinules forming transverse belt extending forward laterally and medially. Length of mature larvae 20 to 25 mm, width of head 2.5 to 2.8 mm.

Pupa (Figure 12): Characterized by presence of large number of spinules in anterior half and on sides of pronotum, and more elongate abdominal tergite VIII. Body comparatively elongate. Head between antennae and vertex flat, with raised margin of frons only near antennal
31 base; occiput lustrous, broadly rounded, coarsely transversely rugose in region of clypeus and labrum. Antennae slender, with apices barely reaching beyond base of midfemora.

Pronotum broadens angularly or roundly in posterior third, narrows anteriorly more (male) or less (female), with narrow constriction near base, produced posterior angles, slightly convex disk, anterior half and sides with numerous sharp, aristate, light rusty spinules, glabrous and lustrous in middle of posterior slope. Mesonotum convex, with transverse pattern, smoothly rounded at posterior margin, with barely elongate shield. Metanotum broad, with median longitudinal groove, and barely protruding transverse streaks.

Abdomen elongate, narrows gradually from anterior to posterior end, or broadens slightly in segments III to V. Abdominal tergites insignificantly convex, with narrow common median longitudinal groove,



30 Figure 12. Pupa of *Xylotrechus hircus* (Gebl.).

with minute (2 to 12) in anterior half and large (18 to 24) spinules behind middle, forming anterior and posterior crossbands respectively, which are interrupted medially by longitudinal groove. Tergite VII oblong, more elongate in female, apically rounded at posterior margin and here with four to six spinules bent geniculately forward; disk with pair of incurved spinules behind middle; anterior half with minute spinules forming small group on disk. Tergite VIII in female oblong, in male transverse, with four to six spinules on posterior margin directed inward and slightly forward. Valvifers of female broad, hemispherical; papilliform, laterally produced at apex. Body length 9.0 to 17.0 mm, width of abdomen 2.5 to 3.5 mm.

Material: Collected in western Siberia (Kulunda, Ob' region, Altai), Ussuri-Primor'e region. Adult insects 232, larvae 28, pupae—two males and two females; larval and pupal exuviae with beetles from pupal cells three. A number of larvae developed from eggs laid by beetles in the laboratory.

Distribution: Northern Asia from Altai, Ob' to the Pacific coast; northern China, Korean Peninsula, Japan. West up to Kulunda (environs of Karasuk) and north up to Tomsk.

Biology: Inhibits birch and mixed plantations. Ecologically associated with birch. Adult insects emerge in June and July. Beetles found on drying and desiccated birch trees, more active in clear weather, run quickly, mate, and often fly from one tree to another. Ovaries of a single dissected female contained 128 mature eggs. Female usually oviposits under remaining scales or in bark crevices. At a temperature of 13.0 to 18.5°C (average 16.4°C) the body contours and light rusty jaws are visible through the egg membrane 10 to 12 days after oviposition, and the fully formed larva breaks through the chorion after 14 to 17 days. Larva initially lives under bark, makes longitudinal gallery along trunk that is sealed by alburnum, and fills it with fine frass. Larva of middle age moves deeper into wood, continues to make longitudinal gallery, and also fills it compactly with frass. These galleries are made in the upper layer of wood or along the pith of a shoot. Larval gallery under bark up to 10 cm long and about 3.0 to 4.0 mm wide, in wood 10 cm long and 4.0 to 5.0 mm wide. Latter terminates in pupal cell up to 30 mm long and 6.0 mm wide.

Pupation observed end of May and in June. Young beetles appear in first half of June and cut round openings (3.5 to 4.0 mm in diameter) 32 on surface of shoots for emergence. They mainly leave pupal cells in second half of June or in July. Generation completed in two years. Records of 12 individuals revealed: weight of larvae before pupation 51 to 127 mg, pupae 46 to 105 mg, and young beetles on emergence 38 to 86 mg.

Found on birch, usually lives on shoots 2.0 to 3.0 cm thick. We collected 201 insects only from birch. Not found on other trees.

5. **Xylotrechus cuneipennis** Kr.

Kraatz, 1879, *Deutsch. Entom. Z.*, vol. 23, p. 110. Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 358–360; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed., pp. 33–34.

Adult (Figure 13): Characterized by highly continuous frontal carinae, sharply projecting carina on vertex, and produced, spinelike outer angles of elytral apices. Head with uneven punctation, along sides of frontal carinae and notch of eyes with adherent white hairs. Frons with parallel sides, sides with bandlike smooth border. Frontal carinae highly contiguous (distance between them less than space between lateral margin of frons and frontal carina), often fused for most part and here covered with large, sometimes longitudinally elongate punctation. Vertex with sharply projecting median carina that is sometimes bifurcate toward front, slightly depressed and matte along sides, with fine dense punctation. Occiput with larger deep dots, with lac glaze. Eyes large, as if flattened. Antennae slender, with apices reaching far beyond elytral base; 3rd segment long, notably longer than lst segment.

Pronotum slightly longer (male) or not longer (female) than wide, rounded laterally, not so smoothly toward anterior end, and abruptly toward posterior end, but here narrower and convex; disk with large punctation, sides with dense minute, transversely elongate punctation, forming distinctly coarse transverse pattern of folds in middle; anterior and posterior margins with curved border, with short and adherent brownish or grayish-brown hairs; posterior half laterally with long thin erect hairs. Scutellum broadly rounded posteriorly, flat or often convex, sometimes compressed anteriorly, with dense punctation bearing dense adherent brownish hairs.

Elytra elongate, narrow slightly toward apex, moderately convex, apically truncate, with sharply produced, spinelike outer angles, rounded or slightly elongate inner angles, with minute, not very dense punctation, and semiadherent dark brown and white hairs forming crossbands. Legs long; hind femora extend beyond elytral apex (male) or slightly short of it (female). Head, pronotum, and scutellum black. Sides of pronotum with white hairy spot at base. Body ventrally dark brown to chestnut with rusty tinge, with short semiadherent dark brown hairs. Episternum of metathorax in posterior half with dense white, compactly adherent hairs. Abdominal sternites I to III with densely hairy white border along posterior margin, which is medially interrupted. Elytra light brown, with straw-yellow tinge, and with white hairy bands: anterior band before middle extends on one side along suture almost up to scutellum, on other

side along lateral margin directed forward; second band behind middle extends from suture backward toward lateral margin; transversely elongate
spot behind humeral tubercle; white hairy border at apex. Antennae rusty
33 or rusty-brown. Legs dark brown, tarsi and tibiae with rusty tinge. Body
length 11 to 22 mm.

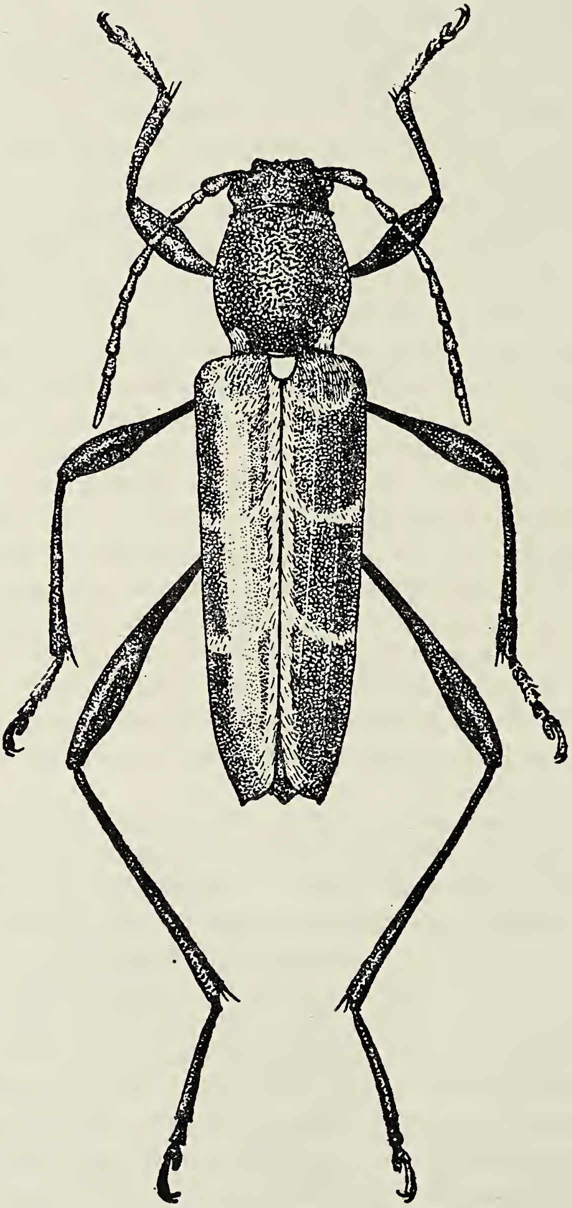
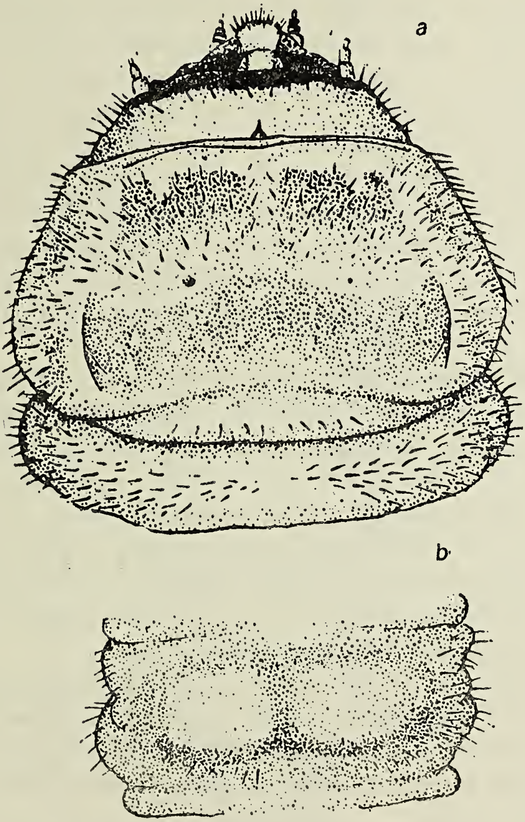


Figure 13. *Xylotrechus cuneipennis* Kr.

Egg: White, elongate, rounded at anterior pole, narrowly rounded at posterior pole, and narrows significantly here. Chorion smooth, hyaline, transparent. Length 1.7 mm, width 0.6 mm.

Larva (Figure 14): Very similar to larva of *X. hircus* (Gebl.). Differs in continuous sclerotization of eusternum, which does not spread to hairy field between glabrous sclerites. Half of head retracted into prothorax; head narrows slightly toward front. Epistoma notably convex medially, with sharply prominent dark brown border with rusty tinge on anterior margin, short minute piliferous pore on posterior margin and here sometimes appears to have transverse depression as well, with brownish longitudinal apical suture in form of faint line. Frontal sutures absent. Hypostoma flat, with parallel sides, straight outer anterior angles, dark brown or rusty border on anterior margin, and rounded notch near inner angles of sclerites. Gular plate narrow, elongate, longitudinally



34 Figure 14. Larva of *Xylotrechus cuneipennis* Kr.
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

groovelike in middle, notched at anterior margin, with angles produced forward. Parietals dark rusty in anterior half, almost black at anterior margin, with numerous light-colored hairs in middle forming crossband. Antennae in extended condition reach beyond anterior margin of cephalic capsule; lst segment longer than two successive segments together. Ocellus near antennal base hyaline, round, 0.50 width of lst antennal segment. Clypeus short, broad, elongate at base. Labrum with narrow basal constriction, broadly rounded toward front, thick, with short rusty hairs in anterior half. Mandibles matte on outer side, with broad median longitudinal depression near base. Inner masticatory lobes of maxillae reddish-brown in first half, whitish in second half, apically truncate,
34 with rusty bristles. Submentum of labium transverse, with produced anterior angles. Mentum wider than long, narrows toward base, anterior half with long rusty bristles laterally forming crossband.

Pronotum in anterior third with yellow or rusty spots, two transversely elongate on disk and one longitudinally elongate on each side; anterior half with rusty hairs before shield and on sides. Pronotal shield rusty, sclerotized, with minute white dots, two notches in anterior margin, markedly produced in middle and at anterior angles, with stray bristles, and laterally bound by deep longitudinal grooves. Alar lobes near longitudinal grooves sclerotized, with minute spinules. Prosternum with short uniform rusty hairs; eusternum sclerotized basally, with minute dense rusty-brown spinules forming broad brownish crossband not reaching hairy field between two glabrous sclerites situated ahead of this band [in *X. hircus* (Gebl.) hairy field between glabrous sclerites sclerotized and covered with minute spinules].

35 Abdomen laterally with minute sparse hairs. Dorsal locomotory ampullae rather convex, divided by common longitudinal groove, on disk white, nonsclerotized, with only posterior margin covered with dense brownish spinules forming transverse band; spinules on tergites V to VII occupy greater part of posterior half of locomotory ampullae. Ventral locomotory ampullae with minute spinules along posterior margin and in lognitudinal groove. Anterior margin of these ampullae with spinules only on abdomial sternites V to VII. Body length of mature larvae 18 to 28 mm, width of head 3.0 to 3.5 mm.

Pupa (Figure 15): Differs from pupa of the closely related species *X. hircus* (Gebl.) in presence of long bristles, and not spinules, on sclerotized base of pronotal disk. Frons, clypeus, and labrum with transverse coarse wrinkles, occiput narrows roundly. Antennae slender, with apices reaching elytral base.

Pronotum oblong (male) or slightly transverse (female), narrows gradually anteriorly and angularly and abruptly posteriorly in posterior third, with narrow posterior constriction, and disk uniformly convex;

middle part and anterior half with acicular bristles directed backward forming large dense hairy field; sides with both bristles and setaceous spinules not only in anterior half but also in posterior; inner sides of posterior angles at posterior slope (in posterior half) glabrous, lustrous. Mesonotum convex, not longer than wide, posterior margin with barely perceptible shield, and sides with minute bristles discernible only under high magnification. Metanotum slightly convex, without perceptible transverse wrinkles, with indistinct median longitudinal groove.

Abdomen broadens in segment IV, narrows anteriorly and posteriorly. Abdominal tergites almost uniformly convex, with narrow median

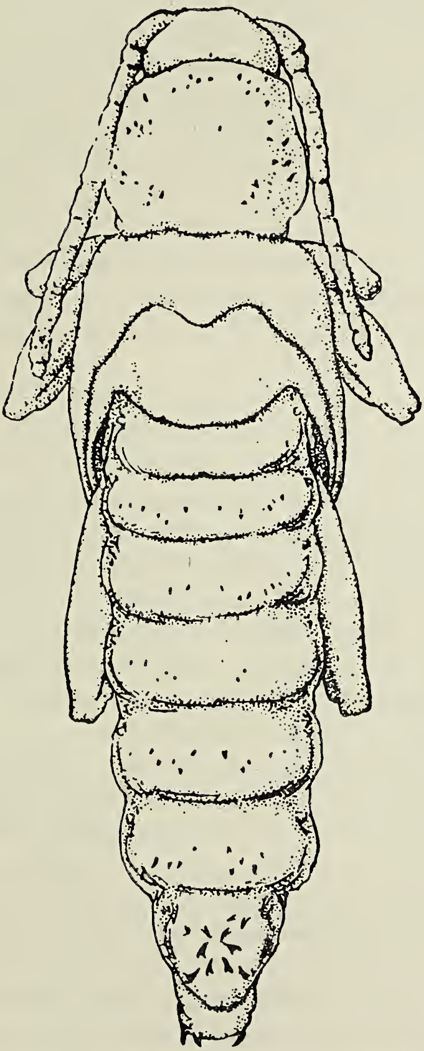


Figure 15. Pupa of *Xylotrechus cuneipennis* Kr.

longitudinal groove, with short dark brown or dark rusty pointed spinules directed backward. Spinules on tergite I very minute, form irregular transverse row. Tergites II to VI in posterior half with large spinules forming broad transverse stripe interrupted medially; protuberance and pair of larger, prominent paramedial spinules situated ahead of stripe; minute spinules in anterior half form jumbled transverse row or stripe. Tergite VII narrows from anterior to posterior end, narrowly rounded posteriorly; posterior margin with four to six large spinules bent forward; two large spinules beyond middle bent inward toward median line; anterior half with minute sharp spinules bent inward also toward median line, forming two transverse rows. Tergite VIII short, transverse (in female also not elongate), broadly rounded posteriorly, with four to six large spinules on posterior margin bent inward and forward. Body length 12 to 24 mm, width of abdomen 4.0 to 5.0 mm.

Material: Collected in Ussuri-Primor'e region, and Sakhalin and Kunashir Islands. Adult insects 497, larvae 260, pupae—10 males and 16 females, larval and pupal exuviae from pupal cells with insects four. A large number of larvae were obtained from eggs in the laboratory.

Distribution: Trans-Baikal region up to Pacific coast, including Amur region, Ussuri-Primor'e region, Sakhalin and Kunashir Islands; outside these limits found in northern China, the Korean Peninsula, Japan. Very abundant in Ussuri-Primor'e region.

Biology: Ecologically better adapted to deciduous forests of the Far East, and belongs to group of species of relict origin. Emergence of beetles 36 observed in July and August. On Kunashir Island we found beetles in small numbers mid-August, and in Ussuri-Primor'e region beginning of August or end of July. During the reproductive period beetles inhabit trees and do not visit flowers. Females oviposit in bark crevices on trunks and thick shoots of maple, oak, and other deciduous trees. A single female can lay more than 100 eggs during her lifetime. According to laboratory observations, at 19.1°C larvae hatch from eggs 13 to 18 days after oviposition. Under natural conditions egg development sometimes continues for up to three weeks.

Larvae live under bark and in wood of drying and dried trees, make galleries in trunks, and fill their entire length with fine frass. After the second hibernation, a pupal cell is made along the trunk in the upper layer of wood at the end of the gallery, from which the larva exits by cutting a hole in the bark. Length of pupal cell 1.7 to 5.0 cm, width 5.0 to 10.0 mm. Larva pupates in pupal cell with its head upward.

Pupation commences early June and ends in July. In 1972 pupae were found in small numbers in Ussuri-Primor'e region in second half of June, and in 1974 on Kunashir Island mainly in July. Pupae develop for two to three weeks. In 1980 pupae developed for 18 to 29 days, average 23 days (observations recorded for 15 pupae), in a forest in the Lazovsk reserve on the coast of the Sea of Japan at a temperature of 11.4 to 21.6°C (average 15.6°C). Emergence of adult beetles from pupae commenced beginning of July and continued up to August. Compared with Ussuri-Primor'e region, development on Kunashir Island is delayed by two weeks or even longer. Beetles emerge from wood in July and August with developed gonads. Ovaries of one female dissected five days after emergence from wood contained 137 fully formed eggs. Beetles mate soon after emergence from wood. Generation completed in two years. Weight records of 59 individuals revealed: larvae from 52 to 444 mg, pupae 47 to 404 mg, young beetles before emergence from wood 38 to 318 mg. In addition to large beetles, midgets were also found. They usually develop in dried wood.

Xylotrechus cuneipennis Kr. develops predominantly on deciduous trees. We obtained 397 beetles from larvae collected in a forest from felled trees: 221 from maple, 123 from hornbeam, 44 from oak, five from elm, two from birch, and two from alder. Additionally, during our forest inspections, 207 larvae, pupae, and adult insects were extracted from the trees examined, including 114 from maple, 47 oak, 26 birch, 12 hornbeam, five common ash, two elm, and one mountain ash. Often found in undergrowth of oak. Damages basal part of trunk.

6. **Xylotrechus ibex** (Gebl.)

Gebler, 1825. In: Hummel's *Ess. Entom.*, vol. 4, p. 53 (*Clytus*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 365–368; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed., pp. 37–39.

Adult (Figure 16): Readily identified by two distinct crossbands on elytra and one crossband behind humeral tubercle. Head with dense fine occiput large punctation; sides of frontal carinae and depression of eyes with dense white or yellowish, vertex light-colored sparse spotty hairs. Sides of frons with broad depressions. Frontal carinae protrude sharply, fuse in anterior half, with large uneven dots, small in posterior half, diverge laterally. Vertex with slightly developed median longitudinal
37 carina, barely perceptible, broadly rounded sclerite on back side laterally in male. Antennae slender; 7th to 8th segments in male and 10th in female reach beyond elytral base; 3rd segment long; 4th segment equal to 5th, 0.66 length of 3rd.

Pronotum slightly longer (male) or equal to, sometimes slightly less (female) than width, narrows abruptly posteriorly and smoothly toward anterior end, laterally rounded, with sharply curved smooth border at anterior and posterior margins, disk convex with coarse punctation, sides with fine punctation, forming pattern of transverse folds, covered with adherent yellowish or grayish hairs; sides, especially in posterior

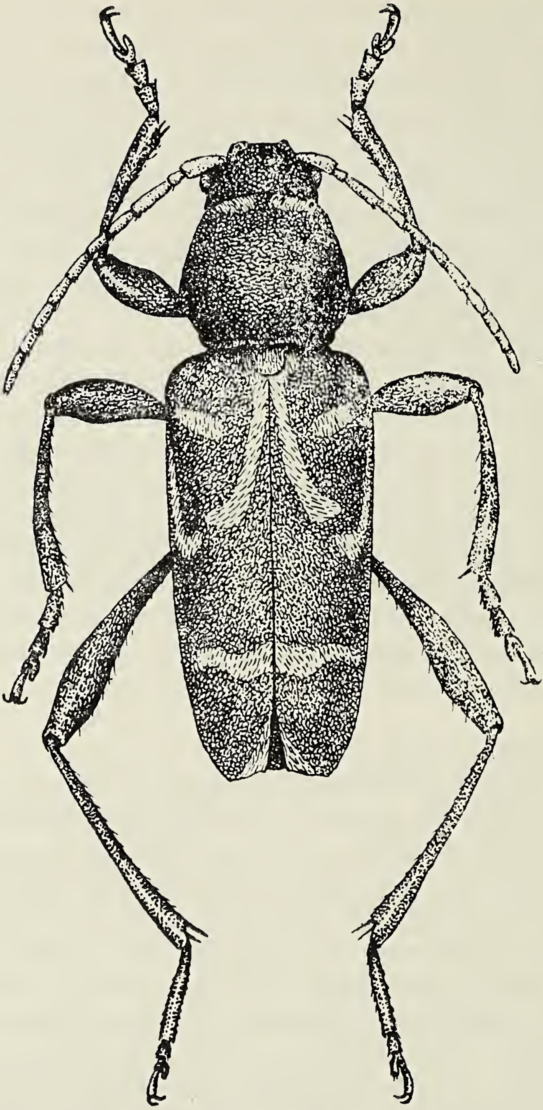


Figure 16. *Xylotrechus ibex* (Gebl.).

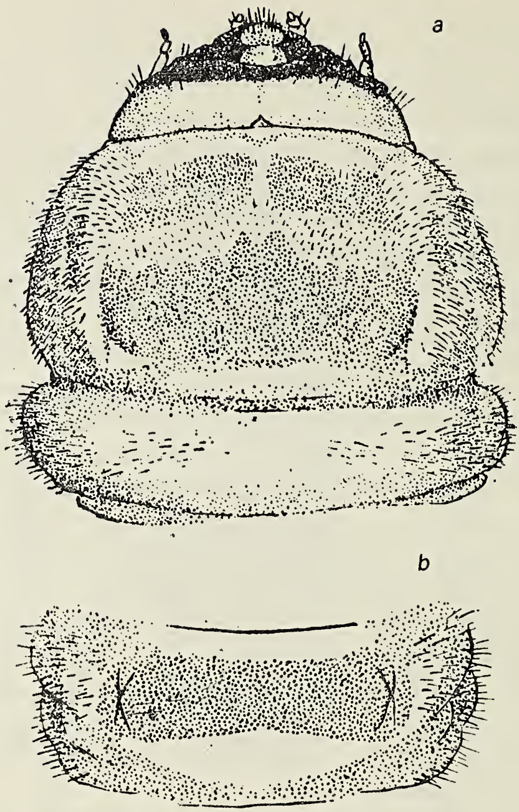
half, with several long erect hairs. Scutellum transverse, broadly rounded posteriorly, with fine punctation and adherent white or yellowish hairs that are denser at apex.

Elytra moderately elongate, with parallel sides or narrow slightly posteriorly, fairly convex, apically slightly truncate inward, with rounded angles (sometimes outer angle more distinct) covered with dense minute rugulose punctation bearing adherent brownish hairs, with transverse yellowish or white bands of hair. Hind femora barely reach or do

not reach beyond elytral apex (male), or fall slightly short of this point (female). Body black, abdomen, sometimes metathorax with rusty or chestnut tinge. Antennae or legs dark or light rusty, legs sometimes almost black, bases of femora and tarsi light rusty (f. *typica*), sometimes legs entirely black (ad. *fugitivus* Thiem.). Body ventrally with semiadherent gray hairs, apices of mesonotal process, posterior margin of metanotum and abdominal sternites I to IV or I to III with dense hairy yellowish or white border, posterior margin of metathoracic episternum with yellow longitudinally elongate triangular spot. Pronotum latterally near anterior or posterior margins with yellowish or white hairy transverse spots that sometimes look like medially interrupted crossband. Elytra dark brown, sometimes with light rusty tinge, with transverse hairy
38 white or yellowish stripe behind humeri; curved crossband before middle that continues onto inner margin up to scutellum and turns forward at outer margin; straight crossband before posterior slope; and white or yellowish hairy border at apex (f. *typica*). Sometimes anterior band medially interrupted (ab. *intrruptus* Pic) or reduced on outer margin and does not turn forward (ab. *subabbreviatus* Plav.), or posterior crossband extends along suture (ab. *angulosus* Motsch., ab. *uralensis* Reitt.). Body length 8.0 to 20.0 mm.

Egg: White, oblong, narrows markedly toward posterior pole and narrow here (almost pointed); broadly rounded at anterior pole. Chorion smooth, hyaline, transparent, without visible sculpture. Length 1.9 to 2.0 mm, width 0.5 to 0.6 mm.

Larva (Figure 17): Similar to larva of *X. rusticus* (L.). Differs in narrower hairy field between glabrous sclerites at base of prosternum, gular plate extends forward beyond margin of hypostoma, and other characters. Head narrows angularly in anterior half, as if compressed between antennal bases. Epistoma slightly convex, slightly depressed at apex,
39 broadly notched or straight at anterior margin, with rusty or dark brown smooth or transversely rugulose border posterior to which paired piliferous pores barely expressed, sometimes almost imperceptible [pores distinct in *X. rusticus* (L.)]. Frontal sutures not visible, median longitudinal suture visible only at apex of epistoma in form of short chocolate-brown stripe, sometimes not perceptible. Hypostoma with parallel sides, barely rounded or straight outer angles, narrow brownish border along anterior margin and here smooth, without transverse wrinkles, with shallow notch near inner angle. Gular plate protrudes slightly beyond anterior margin of hypostoma and here with brownish tinge, slightly convex longitudinally on sides. Parietals along anterior margin (from gular plate to antennal sockets) with dark brown border, and behind it light brown transverse stripe bearing sparse light-colored hairs. Antennae protrude slightly beyond anterior margin of cephalic capsule; 3rd seg-



38 Figure 17. Larva of *Xylotrechus ibex* (Gebl.).
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

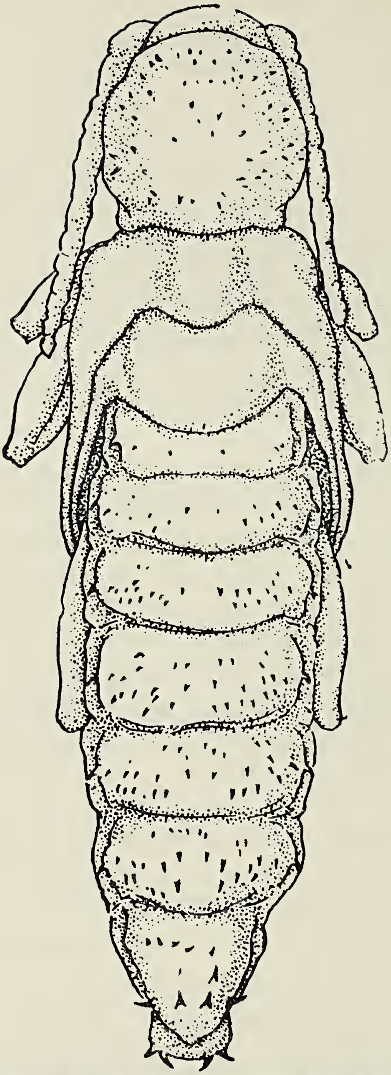
ment barely longer than 2nd. Ocelli small, oval, hyaline, convex, their maximum diameter about 0.40 width of 1st antennal segment. Clypeus trapezoid, broadens markedly toward base and here distinctly reduces, with whitish or light brown tinge. Labrum with sharp or fairly broad basal constriction, narrowly or broadly rounded apically, appears transversely oval, disk glabrous and convex, with short rusty hairs along margins. Inner masticatory lobes of maxillae slightly longer than wide, apically with light-colored, somewhat coarse bristles. Maxillary palps extend beyond apex of inner lobes by two segments. Submentum of labium almost as long or longer than wide, with parallel sides, and with smooth anterior angles. Mentum of labium broadens from base toward front, barely convex laterally and here with bristles that form small group on each side.

Pronotum laterally rounded, narrows very slightly toward front, slopes toward head; with broad transverse yellow rectangular spots in anterior half, and narrow notch in anterior margin; disk ahead of shield with uniform erect rusty hairs directed backward; each side with glabrous, lustrous, yellowish, longitudinally elongate spot that extends backward almost up to sclerotized shield, covered with spinules that reach alar lobes. Pronotal shield convex, with rusty-yellow tinge, two notches in anterior margin, produced anterior angle with cuneiform apical margin, deep lateral longitudinal grooves, sclerotized, with dense minute spinules, and white, longitudinally elongate, alveolar notch. Prosternum sclerotized posteriorly, with minute dense spinules, sides and disk with dense uneven hairs; posterior half with two lustrous glabrous sclerites in region of eusternum that are divided almost up to posterior margin by hairy (partly sclerotized) field, which is much narrower than sclerites themselves [in larva of *X. rusticus* (L.) this field is usually broader than sclerites separated by it].

Abdomen rather elongate, laterally with short, not very dense light-colored hairs, without hairs anterior and posterior to locomotory ampullae. Dorsal locomotory ampullae moderately convex, transversely elongate, entirely covered with dense minute spinules, and laterally with longitudinal curved folds. Ventral locomotory ampullae laterally with alveolar short (on anterior sternites) or long leaner (on posterior sternites) longitudinal grooves; posterior grooves more lateral than anterior ones. All locomotory ampullae of abdomen without bristles [in *X. rusticus* (L.) with bristles only in anterior half]. Body length of mature larvae 20 to 25 mm, width of head up to 3.0 mm.

Pupa (Figure 18): Differs from pupa of *X. rusticus* (L.) in position of spinules on pronotum. Body comparatively elongate. Head between antennae and vertex flat, with median longitudinal depression, broadly rounded on occiput, and with slightly squarrose or elongate transverse wrinkles on clypeus and labrum. Antennae slender, extend beyond base of midfemora.

Pronotum as long or slightly longer than wide, in posterior third broadens angularly or roundly, narrows abruptly posteriorly but gradually anteriorly, with narrow transverse groove near posterior margin that is often in form of narrow constriction when posterior angles protrude more; with minute aristate spinules forming largest group in anterior half (especially longitudinal group in form of broad stripe on disk and sides) and in posterior third (before transverse groove). Mesonotum glabrous, convex, slightly depressed (saddle shaped) behind middle, transversely rugose (in some insects wrinkles barely perceptible), rounded at posterior margin, with slightly elongate scutellum. Metanotum lustrous, smooth, with median longitudinal groove, sometimes with stray minute spinules.



38 Figure 18. Pupa of *Xylotrechus ibex* (Gebl.).

Abdomen elongate, narrows slightly toward anterior end but gradually more so posteriorly. Abdominal tergites convex in posterior half, middle tergites with common narrow longitudinal groove. Tergite I with eight to ten minute spinules, forming irregular transverse row. Tergites II to VI with 16 to 22 large spinules in posterior half that are bent backward and form transverse stripe. Tergites III to VI additionally with minute spinules in anterior half forming transverse row or crossband. Tergite VII narrows posteriorly, with narrowly rounded posterior margin and here with four or five, rarely six large geniculate spinules bent forward; disk with pair of similar large spinules behind middle that are bent inward and tilt slightly forward; minute spinules (three to 16) in anterior half, bent inward and slightly backward, form cluster. Tergite VIII short, width 2.0 times length, posterior margin with four spinules bent forward and partly toward median line. Valvifers of female slightly separated or barely touch each other, with apically produced tubercle. Body length 12 to 22 mm, width 3.5 to 5.0 mm.

Material: Collected in western Siberia (Altai, Salair, Tuva, Middle Ob' region), Ussuri-Primor'e region. Adult insects 51, larvae 112, pupae—eight males and seven females, larval and pupal exuviae with beetles from pupal cells four. Larvae obtained from eggs laid by beetles in the laboratory.

Distribution: West Europe (rarely), Ural, western and eastern Siberia up to Pacific coast; northern Mongolia, northern China, north of the Korean Peninsula. Occurs in particularly large numbers in Ussuri-Primor'e region.

Biology: Included in the fauna of deciduous forests, but confined more to birth plantations. Beetles fly in June and July. They live a cryptic mode of life, do not appear on flowers, and during reproduction are found on trees inhabited by them. Mating takes place on trees, after which females oviposit. Ovaries of one female dissected four days after emergence from wood, which had not yet commenced oviposition, contained 28 large and fully mature eggs. Females deposit eggs on tree trunks in bark crevices or under peeling cork layer. Inhabit drying or
41 fresh wind-fallen trees of birch, rarely elm, alder, and hornbeam. Larvae began to hatch on August 10 at 20.8 ± 0.7°C from eggs laid by beetles on July 26 and 27, i.e., development of eggs continued for about 14 days.

Newly hatched larvae bore bark, make galleries in it that leave no impression on alburnum, and fill them with fine frass. Only galleries made by older larvae are weakly or fairly well impressed on alburnum. They are widely (smoothly) sinuous, sometimes cover trunk, and visible on outer side. Cork layer here, for example in birch, rises in form of small ridge under pressure of frass in compactly filled gallery. Larva of last instar makes pupal cell in bark in such a way that its end lies in cork layer. Length of larval gallery before pupal cell 7.0 mm. Length of pupal cell 18 mm, width 5.0 to 7.0 mm. Larva pupates in pupal cell with head directed toward cork layer. Duration of pupal phase about three weeks. Pupation commences beginning of June and ends in second half of July. Young beetles make round openings in bark, emerge through them from wood, and start to reproduce almost immediately. Generation completed in two years, occasionally development univoltine.

In laboratory investigations, for example, the cycle of development from egg to adult was completed in eight months. Based on records of eight insects, weight of larvae before pupation 78 to 316 mg, pupae 70 to 286 mg, and beetles before emergence from wood 37 to 229 mg. This species generally attacks drying and wind-fallen trees with moist fresh bark and juicy bast. Desiccated trees are usually avoided. During our inspection of trees 140 larvae, pupae, and beetles were extracted from bark, including: 131 from birch, seven elm, one hornbeam, and one alder. In addition, 10 beetles were obtained from larvae collected from forest trees, including seven from birch, one hornbeam, one common alder, and one Japanese alder.

7. **Xylotrechus clarinus** Bat.

Bates, 1884, *J. Linn. Soc. Lond. Zool.*, vol. 18, p. 231; Tamanuki, 1933, *Ins. Mats.*, vol. 8, p. 78; Matsushita, 1933, *J. Fac. Agr. Hokkaido Univ.*, vol. 34, p. 269; Mitono, 1941, *Bull. Agr. For. Tainoku Univ.*, vol. 2, p. 94; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 242; Kojima and Okabe, 1960, *Food Plants of Jap. Cerambycidae*, pp. 23–24, 135; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 76.

Adult (Figure 19): In overall dimensions very similar to *X. ibex* (Gebl.). Differs considerably in shape of pronotum, shorter antennae, anteriorly turned crossband before posterior slope of elytra, and other characters. Body comparatively elongate. Head moderately retracted into prothorax, with fine dense punctation, sides of frons and depression of eyes with dense hairs, remaining part with sparse gray adherent hairs. Frons convex, frontal carinae very distinct, space between them with dense rugose punctation, and width of carina not less than space between carina and lateral margin of frons. Eyes on inner side with shallow depression and minute facets. Antennae short, apices barely reach beyond base of pronotum (male) or just reach it (female), and with sparse adherent light-colored hairs; 5th antennal segment distinctly shorter than 3rd, barely longer than 4th; 1st segment pointed at apex.

Pronotum transverse, broadens angularly behind middle [in *X. ibex* (Gebl.) smoothly and uniformly rounded on sides], with narrowly turned anterior and posterior margins, markedly convex on disk, with minute dense uniform punctation bearing minute adherent and erect thin light-
42 colored hairs that are barely perceptible on sides, near anterior and posterior margins with dense compactly adherent yellow hairs forming two transverse borders interrupted medially. Scutellum flat, broadly rounded posteriorly, with fine punctation, and dense adherent yellow hairs along posterior margin.

Elytra narrow slightly posteriorly (male) or with parallel sides (female), notably convex on disk, with smoothly rounded humeri, obtuse apically, with fine very dense punctation that fuses almost into constriction, and short, comparatively sparse, adherent brownish hairs, with yellow crossbands of dense hairs. First crossband behind scutellum short, does not reach suture and lateral margins of elytra. Second band before middle of elytra, extends from lateral margins toward suture and here turns at sharp angle toward scutellum, slightly separated toward front on lateral margin. Third crossband before posterior slope turns toward front and near suture extends slightly backward. Apex of elytra with broad yellow hairy border. Small group of yellow hairs near scutellum at base of elytra. Hind femora distinctly fall short of elytral apex. Hind tarsi 0.66 length of tibiae. First segment of hind tarsi long, slender, much longer than all

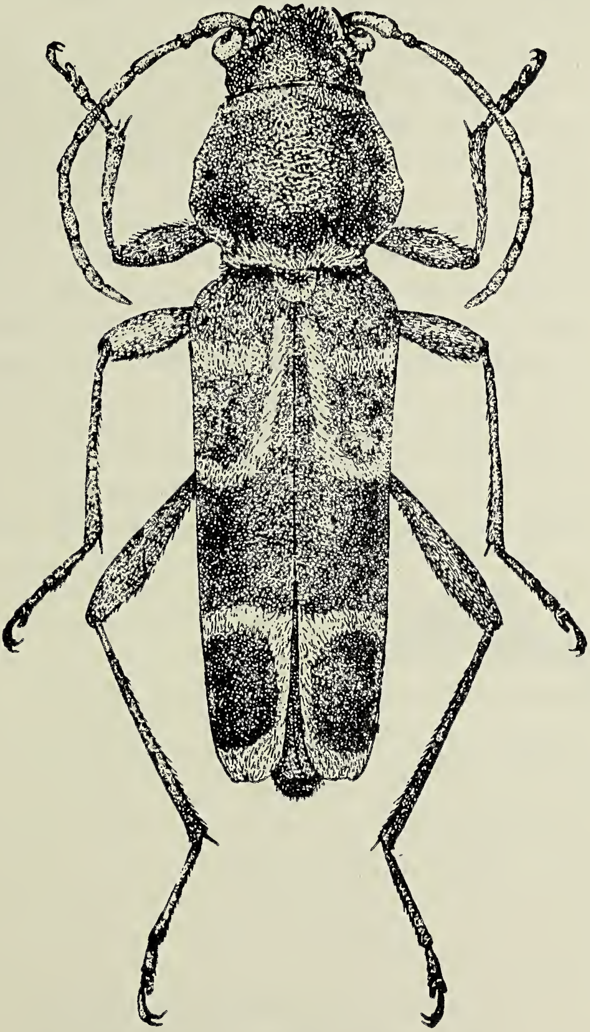


Figure 19. *Xylotrechus clarinus* Bat.

other segments together. Body ventrally with fine dense punctation bearing sparse light-colored hairs. Episternum of metathorax with dense punctation, and dense yellow hairs in posterior half forming one spot on each side. Abdominal tergites with dense hairy yellow border on posterior margin. Male genitalia characterized by presence of long thick bristles at apex of parameres, arch of phallobase smoothly rounded laterally [in *X. ibex* (Gebl.) angularly turned on sides]. Body black, antennae and legs rusty. Elytra black or blackish-brown, with short rusty border laterally near base. Body length 12 to 13 mm.

Egg: White, elongate, anterior pole broadly and posterior pole narrowly rounded or pointed. Chorion with fine nonalveolate sculpture. Length 1.8 mm, width 0.6 mm.

43 *Larva* (Figure 20): Very similar to larva of *X. ibex* (Gebl.). Differs in structure of pronotal shield, apically very narrow gular plate, and other characters. Body white, moderately elongate. Head markedly retracted into prothorax, narrowly rounded anteriorly. Epistoma convex, lustrous, fuses laterally with parietals (frontal sutures not visible), apically divided by faint median longitudinal suture, and with distinct dark brown border on anterior margin. Hypostoma convex, narrows slightly anteriorly, with distinct notch on anterior margin near inner angles of sclerites, with sharp spinule on outer margin behind which supporting spinule of maxillae located. Gular plate basally very broad, apically narrow (in second half), with almost parallel sides. Parietals with diffuse rusty border on anterior margin, and several short light-colored hairs in anterior half. Antennae long, prominent behind anterior margin of cephalic capsule; 1st segment not shorter than total length of remaining segments. Clypeus trapezoid, translucent, small. Labrum whitish, narrows

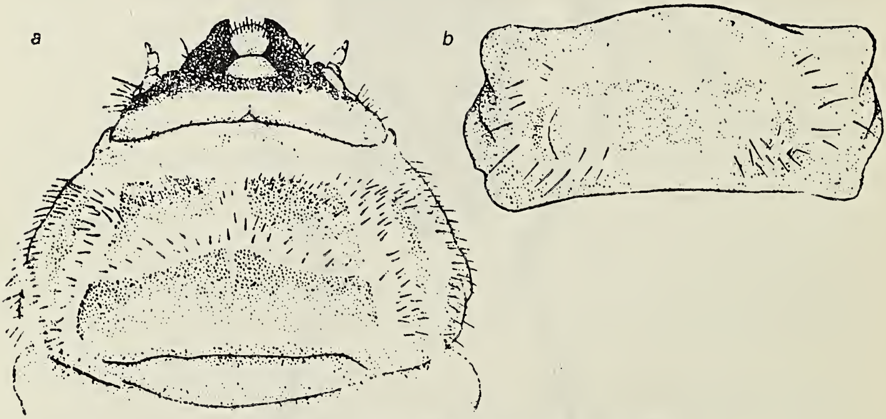


Figure 20. Larva of *Xylotrechus clarinus* Bat.
a—head and pronotum; b—abdominal tergite IV with dorsal locomotory ampulla.

toward apex, broadens roundly or angularly toward base, and in anterior half with short light-colored bristles.

Pronotum convex, somewhat narrowly rounded anteriorly, in anterior third of disk with two transverse yellow spots that broaden slightly toward sides and with deep notch in anterior margin; sides with glabrous yellow spot; hairy cover consists of moderately dense, short, thin rusty hairs directed backward; anterior margin of yellow spots with minute yellowish-rust hairs forming crossband. Pronotal shield convex, entirely sclerotized, bound laterally by straight longitudinal grooves; anterior margin slightly rounded but medially produced and from here slopes smoothly toward sides and not produced at anterior angle (in *X. ibex* (Gebl.) shield markedly produced medially on anterior margin and at anterior angles; thus it appears deeply notched along sides of median line]. Prosternum convex on lower side; presternum with short dense hairs; two round glabrous sclerites of eusternum completely separated by hairy field; posteriorly eusternum, especially anterior half of sternellum, sclerotized. Meso- and metasterna with convex disk, with dense short hairs, sclerotized.

Abdomen gradually narrows posteriorly laterally, with sparse short 44 hairs. Dorsal locomotory ampullae on tergites I to VII moderately convex, with common median longitudinal groove, entirely sclerotized, and laterally with short longitudinal grooves. Ventral locomotory ampullae entirely sclerotized, transversely elongate, with smooth median constriction. Body length up to 20 mm, width of head 2.1 mm.

Material: Collected from Kunashir Island. Adult insects—two males and females, larvae three.

Distribution: Sakhalin, South Kuril' Islands (Kunashir, Shikotan, Iturup); Japan, Korean Peninsula, northeast China (Gressit, 1951).

Biology: Inhabits deciduous forests. Ecologically associated with Betulaceae. Beetles fly from end of July to September. Female oviposits on trunks of drying and freshly fallen trees. Ovaries of one female dissected on fourth day after emergence from pupa contained 28 mature eggs. Larvae live under bark, make meandering galleries, and fill them with frass containing bark. Galleries leave no impression or just slight impression on alburnum. Larva of last instar makes pupal cell in bark at end of gallery, with its anterior end in bark layer. Width of gallery before pupal cell 7.0 mm. Length of pupal cell 18 mm, width 7.0 mm. Beetles emerge from pupae in second half of July, from pupal cells in last 10 days of July and first half of August.

Xylotrechus clarinus Bat. develops predominantly on birch (*Betula*) and is an ecological variant of the closely related species *X. ibex* (Gebl.), which is widely distributed in northern Asia and also ecologically associated with birch. According to Japanese researchers, *X. clarinus* Bat.

is trophically associated in the larval phase with birch (*Betula costata*, *B. ermani*, *B. grossa*, *B. maximowicziana*, *B. platyphylla*) and alder (*Alnus hirsuta*, *A. japonica*). However, we found it only on birch.

8. **Xylotrechus arvicola** (Oliv.)

Olivier, 1795, *Entomol.*, 4, 70, 64 (*Callidium*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 370–372; Teppner, 1965, *Entom. Nachrichtenbl.*, 12, 4, 25–34; Demelt, 1966, *Tierwelt Deutschlands*, 52, 2, 74–75; Villiers, 1970, *Entomologiste*, 26, 1–2, 1–3.

Adult (Figure 21): Externally similar to *X. ibex* (Gebl.). Differs in frontal carinae fused posteriorly with longitudinal carina of vertex, presence of coarser transverse pattern of folds on pronotal disk, and posterior crossband of elytra curves slightly anteriorly. Frons fairly convex, with markedly turned lateral margin, and dense white or yellowish hairs forming two longitudinal stripes along sides of carinae. Frontal carinae protrude sharply, shifted slightly, and fuse toward front; space between them less than space between carina and margin of frons. Vertex with projecting median longitudinal carina that is bifurcate toward front, and here merges with frontal carinae into single glabrous structure with coarse longitudinally elongate punctation in middle. Vertical sclerites indistinct, with fine (male) or large (female) punctation, usually matte. Occiput with larger distinct deep dots. Antennae thicken slightly toward apex; 8th to 9th segments reach elytral base; 3rd segment long, equal to 1st segment, and longer than either 4th or 5th.

Pronotum convex, laterally rounded or broadens angularly slightly, anteriorly narrows gradually and posteriorly abruptly, disk with larger, gradually elongate, fine dense punctation on sides, slightly oblong (male)
45 or notably transverse (female), sometimes with broad oval depression laterally in posterior half, with dense transverse yellow stripe laterally at anterior margin, and with or without yellow spot laterally at base. Scutellum transverse, broad, its width almost 2.0 times length, broadly rounded posteriorly, and with short adherent hairs.

Elytra narrow slightly from base toward apex, on inner side near humeral tubercle with more or less distinct longitudinal depression, apically truncate, with elongate outer angle and obtuse and slightly rounded inner angle, with minute dense punctation and short brownish adherent hairs, and short, transverse, yellow hairy stripe; disk with two transverse, dense, yellow hairy bands, one before middle on inner suture that bends roundly forward (slightly extends beyond transverse lateral stripe) but barely so on outer margin; second band in posterior half bends forward more sharply. Elytral apex with yellow hairy border. Pro-, meso-, and metasterna with dense yellow hairy spot laterally; posterior margin of metathorax and abdominal sternites I to IV with

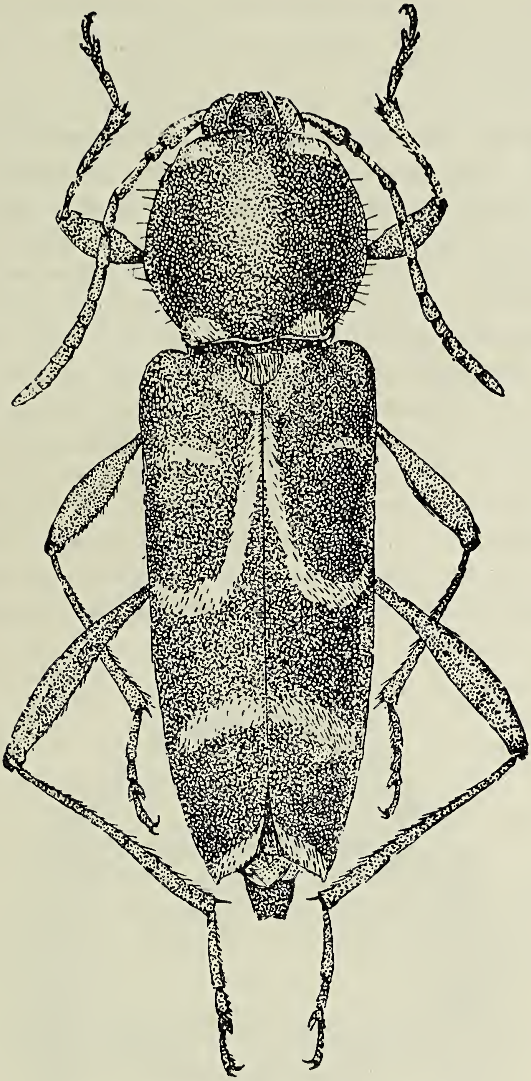


Figure 21. *Xylotrechus arvicola* (Oliv.).

yellow hairy border along sides. Body black. Antennae and legs reddish-rust; femora sometimes with brownish tinge distally. Elytra black, with brownish tinge, light rust at base and under hairy bands (f. *typica*). Sometimes anterior part of elytra light rust up to crossband (ab. *basifasciatus* Plav.) or, contrarily, entirely black (ab. *inbasalis* Pic); sometimes light-colored hairy spot present laterally before middle, as if separated from crossband (ab. *bipunctatus* Dayr.), or band before middle on inner margin barely curves forward, markedly reduced (ab. *degradatus* Plav.). Body length 8.0 to 20.0 mm.

Egg: White, narrows gradually toward posterior pole, broadly ronuded at anterior pole and narrowly at posterior pole. Chorion smooth, hyaline, transparent. Length 1.8 mm, width 0.6 mm.

Larva (Figure 22): Differs from closest species, *X. antilope* (Schönh.), in smooth matte scutellum of pronotum and other characters. Head short; half its length retracted into prothorax. Epistoma with smooth 46 dark reddish border at anterior margin, barely perceptible transverse streaks laterally, distinctly notched near clypeus behind border, with thin hairs forming two transverse rows. Frontal sutures and longitudinal suture of epistoma lacking. Hypostoma with almost parallel sides, barely rounded at anterior angles; hypostomal sclerites with elongate inner angles, with triangular notch near them, narrow rusty border on anterior margin, and transversely rugose in anterior half. Parietals with broad dark rust border in anterior third covering antennal sockets on upper side, with narrow white clearance only in region of ocellus, and stray thin light-colored hairs behind border. Antennae comparatively long; 3rd segment more than 2.0 times longer than 2nd. Ocellus near antennal base hyaline, convex, its sides 0.50 width of 1st antennal segment. Clypeus translucent, hyaline, with almost parallel sides, its length 0.50 width.

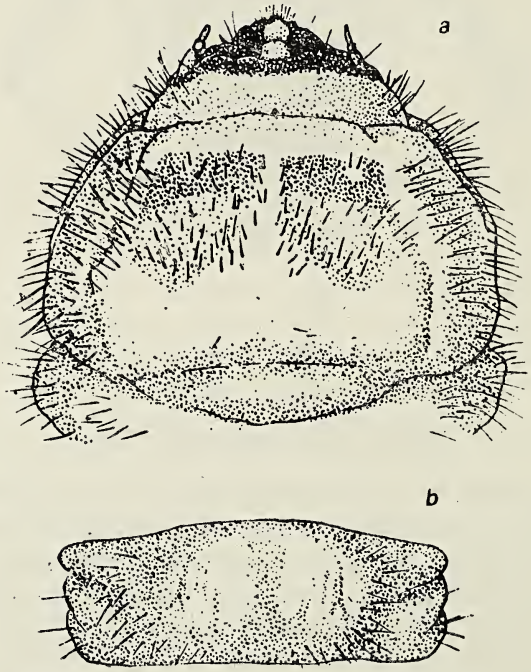


Figure 22. Larva of *Xylotrechus arvicola* (Oliv.).
a—head and pronotum; b—abdominal tergite IV with dorsal locomotory ampulla.

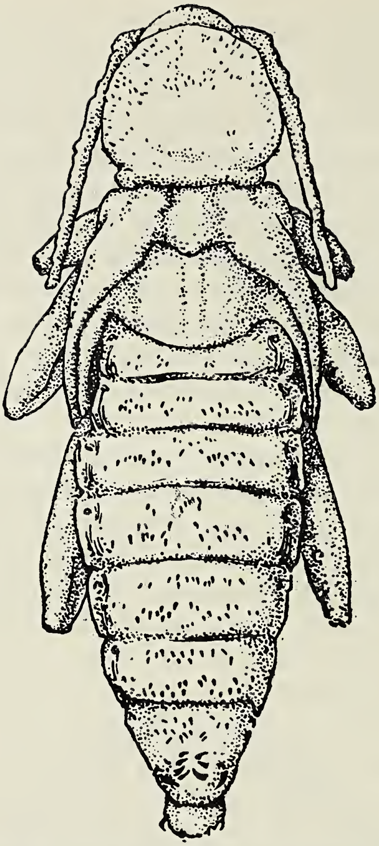
Labrum convex, whitish, narrows abruptly toward base and gradually toward apex, and here narrowly rounded, with sparse dense bristles in anterior half. Mandibles black, polished on outer side of apex, with transverse protuberance at base, and deep transverse groove before protuberance. Inner masticatory lobes of maxillae equal to or slightly longer than wide, apically truncate, with produced inner angle, and here with stray bristles along lower margin forming distinct transverse row. Maxillary palps notably longer than inner masticatory lobes. Submentum of labium with parallel sides, narrows toward front similar to humeral plate, with pair of longitudinal grooves that appear to be continuation
47 of inner gular-hypostomal suture. Labial mentum transverse, broadens slightly toward apex, with long rusty bristles medially that form group or transverse stripes on sides.

Pronotum slopes toward head, broadly rounded at anterior margin, anterior third of disk with broad transverse yellow spots notched along anterior margin, with thin rusty, comparatively dense hairs on disk ahead of shield, and sides with one indistinct, longitudinally elongate yellowish spot. Pronotal shield convex, white, laterally bound by deep longitudinal grooves, produced medially at anterior margin angularly forward, and with narrow notch near outer angles; base with minute tubercular spinules, visible under high magnification, forming transverse stripe along broad border; ahead of border shagreen, matte, smooth, without longitudinal wrinkles. Prosternum with dense thin rusty hairs on presternum; eusternum with wide glabrous median sclerites divided anteriorly by broad dense hairy field; posterior margin (sternellum) with barely perceptible sclerotized border or without it.

Abdomen with thin light-colored hairs on sides and near locomotory ampullae. Dorsal locomotory ampullae convex, uniformly and lightly shagreen, divided by common broad median longitudinal groove, laterally with groove or alveolar longitudinal folds that curve outwardly. Ventral locomotory ampullae more transversely elongate, laterally with two short groovelike folds that are distinct in live larvae. Body length of mature larvae 20 to 26 mm, width of head 3.0 mm.

Pupa (Figure 23): Characterized by presence of minute aristate spinules along periphery of pronotum. Head between antennae with slight longitudinal depression, notably flat on vertex; occiput smoothly rounded, lustrous; anterior part of frons and clypeus transversely rugose. Antennae short, with apices pressed to sides, and extend only beyond mesonotum.

Pronotum not longer (sometimes almost shorter) or slightly longer than wide, broadens angularly behind middle, gradually (insignificantly) anteriorly, and narrows abruptly posteriorly, with notable constriction at base, broadly rounded apically, with clusters of minute aristate



46 Figure 23. Pupa of *Xylotrechus arvicola* (Oliv.).

spinules along sides and in anterior half; disk in posterior half glabrous, lustrous, hyaline, and here more convex. Mesonotum smooth, longitudinally convex, posteriorly with insignificantly elongate scutellum. Metanotum with median longitudinal groove, stray, rarely perceptible bristles laterally. Hind femora distally reach beyond abdominal sternite IV.

Abdomen moderately elongate, broadens in segment IV, narrows very slightly anteriorly and more posteriorly. Abdominal tergites moderately convex, with numerous large sharp spinules behind middle forming transverse stripe (20 to 24 spinules in stripe, of which middle ones located closer to median line, and directed slightly forward); anterior half with minute spinules forming transverse row or crossband (of two to 16 spinules). Latter spinules directed backward. In most specimens spinules in posterior half large, and only relatively smaller in some specimens. Tergite VII more elongate, rounded posteriorly; posterior half with very large sharp spinules (of which two to eight on posterior angle geniculate, bent forward; four incurved spinules arranged in pairs behind middle); anterior half with minute sharp incurved spinules forming common spinescent field on disk (of four to 16 spinules). Tergite VIII short, transverse, broadly rounded posteriorly, with two to four 48 incurved spinules. Valvifers of females hemispherical, contiguous, with round apical projection. Body length 11 to 21 mm, width of abdomen 3.5 to 4.0 mm.

Material: Collected in southern Ural. Adult insects 70, larvae 36, pupae—four males and six females, larval and pupal exuviae with beetles from pupal cells four.

Distribution: West from Atlantic Ocean east to southern Ural; north from Scandinavia, Yaroslav' south to the Caucasus, Iran, Turkey, northern Africa. We found them in Orenburg and Ural'sk.

Biology: Inhabits deciduous forests. Ecologically associated with many trees. Beetles predominantly fly during July to mid-August, do not feed, usually do not visit flowers, and found on host trees. Females oviposit in bark crevices on trunks of drying, freshly fallen trees with bast still moist. Mainly colonizes lower (basal) zone, rarely middle zone of trunks. Characterized by comparatively high fecundity. Ovaries of one female just emerged from pupal cell contained 72 mature eggs, of another 116. Larvae hatched from eggs two to three weeks after oviposition. For example, 75 eggs were kept under observation in the laboratory. Of these, at 15 to 21°C (average 18.8 ± 0.4°C) larvae appeared 14 to 18 days, average 15.8 ± 0.1 days, after oviposition.

Mature larvae rupture chorion, bore wood, and there some make longitudinal galleries from lower side upward in upper layer along periphery of trunk, while others bore deeper layer, and fill galleries with fine frass. Sometimes galleries fuse into common longitudinal sector of damaged wood. Galleries made by I-instar larvae are about 2.0 mm wide, those of later instars 10 mm wide. Gallery terminates in pupal cell located longitudinally in trunk in upper layer of wood. Exit cut on surface at end of pupal cell. A layer of wood about 1.0 mm thick remains between exit and bark. Length of pupal cell 14 to 40 mm, width 5.0 to 8.0 mm. Length of exit from pupal cell 10 to 15 mm, width 4.0 to 5.0 mm. Larvae pupate in pupal cell with head upward, i.e., toward exit.

Pupation takes place in June. Maximum pupae found at end of this month. Young beetles emerge from pupae predominantly beginning of July. Fully formed beetles emerge from pupal cell through exit, cut round opening 3.0 to 5.0 mm in diameter on surface of bark, and exit. They have matured by this time and start reproduction soon after emergence from wood. Generation completed in two years. Weight records of 19 individuals before metamorphosis revealed: weight of larvae before pupation ranges from 42 to 288 mg, pupae 37 to 257 mg, and young beetles before emergence from wood 31 to 202 mg. Individual larvae not yet ready for pupation weighed up to 293 mg.

Xylotrechus arvicola (Oliv.) lives on mature and overripe trees with a shoot diameter up to 80 cm, as well as undergrowth with a shoot diameter up to 4.0 cm; it always prefers the lower (basal) zone of the trunk, although a certain number also lives in the middle zone. In a forest we extracted 43 beetles from shoots of trees inhabited by larvae, including 21 from choke-cherry, 11 from oak, six hawthorn, two apple, one elm, and one birch. Sometimes *Plagionotus detritus* (L.), *Phymatodes testaceus* (L.), and *Mesosa myops* Dalm. also live together with this species on oak, developing in and under bark.

49 9. **Xylotrechus antilope** (Schönh.)

Schönherr, 1817, *Syn. Ins.*, 1, 3, 465 (*Clytus*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 372–374; Teppner, 1965, *Entom. Nachrichtenbl.*, 12, 4, 25–34; Demelt, 1966, *Tierwelt Deutschlands*, 52, 2, 75.

Adult (Figure 24): Differs from other species of the genus in very narrow gap between frontal (almost fused) carinae, markedly truncate elytral apex, and other characters. Head with uniform, vertex denser punctation, and sparse gray hairs. Frontal carinae long, thin, almost fuse into unified, longitudinal, slightly broadened stripe in middle part, which extends backward up to occiput. Occiput rounded, with small distinct dots. Antennae comparatively long; 7th segment (male) or 9th (female) reaches elytral base, with minute adherent hairs; 5th segment slightly longer than or equal to 4th, but shorter than 3rd.

Pronotum slightly longer (male) or shorter (female) than wide, laterally rounded, convex on disk, medially with squarrose, transversely elongate folds, near anterior and posterior ends as well as laterally with dense, somewhat granular punctation, with minute brownish hairs; anterior margin laterally with broad stripe; posterior margin (slightly away from edge) narrow, transverse, yellow or gray hairy stripe. Scutellum semicircular or almost triangular, broadly or narrowly rounded posteriorly, with brownish adherent hairs posteriorly and yellow hairs anteriorly.

Elytra moderately convex, narrow markedly toward apex, with apex truncate toward inner side, outer angle produced, spinelike, inner angle rounded and with fine dense punctation, with brownish adherent hairs, and with yellowish crossbands. Legs long; hind femora of male extend beyond elytral apex, of female reach this point. Body ventrally with erect light-colored hairs; posterior margin of meso- and metasterna and abdominal sternites I to III with broad yellowish hairy border. Body black. Antennae dark rust, femora black or blackish-brown, tibiae and tarsi

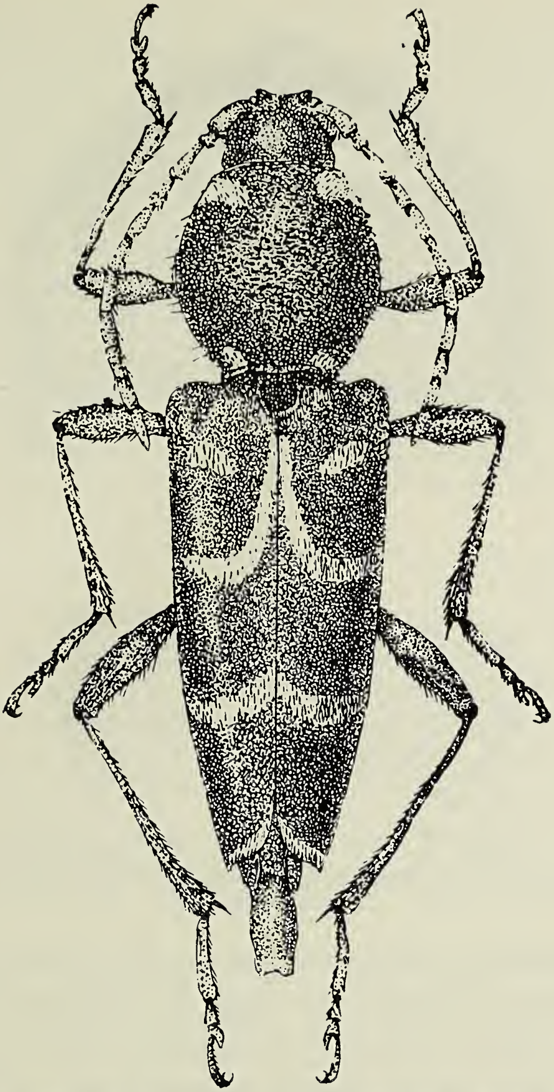


Figure 24. *Xylotrechus antilope* (Schönh.), female.

rusty-brown or rusty. Elytra black or blackish-brown, with or without rusty spot at base near scutellum. Behind humeri with short transverse yellowish hairy stripe; before middle with yellow transverse band covered with yellow hairs, at inner margin extending toward scutellum and at lateral curving forward slightly; thin transverse band before posterior third extends from suture almost up to lateral margin; and narrow yellow hairy border at apex. Body length 8.5 to 12.0 mm.

Egg: White, moderately elongate, rounded at poles. Chorion smooth, lustrous. Length 1.2 mm, width 0.5 mm.

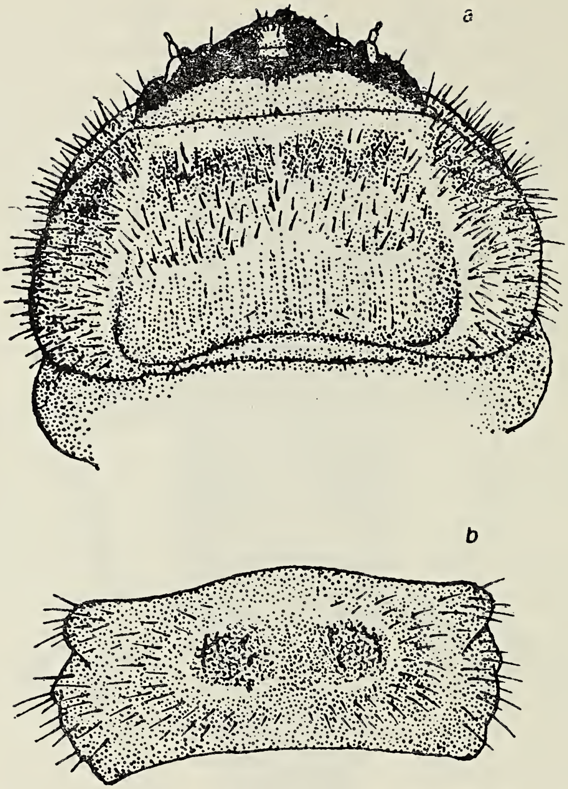


Figure 25. Larva of *Xylotrechus antilope* (Schönh.).
a—head and pronotum; b—abdominal tergite IV with dorsal locomotory ampulla.

Larva (Figure 25): Characterized by longitudinal pattern on pronotal shield, transverse submentum of labium, and slightly produced angles at anterior margin of gular plate. Head narrows slightly toward front, with almost parallel sides. Epistoma with dark brown smooth broad border at anterior margin, straight near clypeus, even, with stray thin hairs behind border forming transverse row, and laterally not demarcated from parietals. Frontal sutures not visible. Longitudinal suture present in individual insects as very short apical brownish line. Hypostoma laterally with parallel or slightly divergent sutures, anterior outer angles almost right angled, with narrow rusty or dark brown border at anterior margin, notch near inner angles of sclerites, and in anterior third sometimes with thin linear wrinkles. Gular plate longitudinal, its length notably more than width at base, with notch at apex, angles 51 protruding forward, and brownish tinge throughout surface. Parietals in anterior third entirely rusty-brown or dark brown, without longitudinal whitish clearance near ocellus, and with thin light-colored hairs before middle forming crossband. Antennae slender, with apices reaching beyond anterior margin of cephalic capsule; 2nd segment 0.50 length of 3rd. Ocellus near antennal base very small, hyaline, 0.33 width of 1st antennal segment. Clypeus short, broadly elongate. Labrum narrows toward front, narrowly rounded apically, with short bristles along margin. Mandibles massive, black, flattened on outer side. Inner masticatory lobes of maxillae hyaline, obtuse at apex, and here with short light-colored bristles. Maxillary palps thin, elongate, narrow significantly toward apex, and slightly longer than inner lobes. Labial submentum transverse, marginally divided into three longitudinal lobes, of which middle lobe contiguous with notch of gular plate on back side, lateral lobes with corresponding notches of sclerites of hypostoma, where labium fuses with maxillae into unified labial-maxillary complex. Mentum transverse, uniformly rounded on sides, convex on lower side, with rusty bristles mediolaterally forming one dense brush on each side.

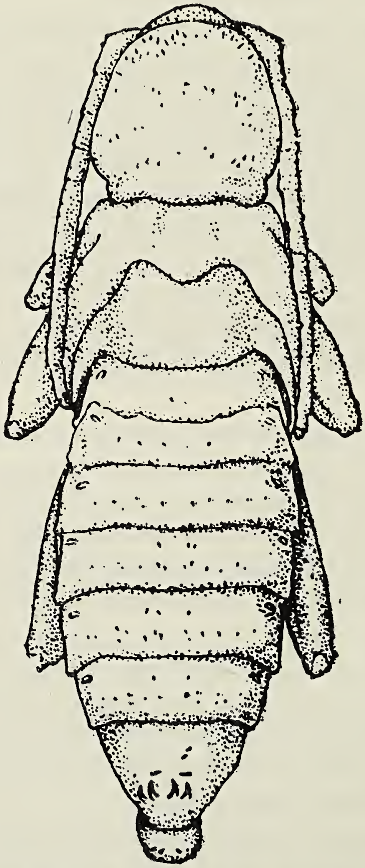
Pronotum 2.0 times wider than long, with two transverse rectangular yellowish-rust spots in anterior third, deep notch on anterior margin, laterally with longitudinally elongate lustrous yellow spot; disk ahead of shield and on sides with long yellowish hairs forming cluster. Pronotal shield white, slightly produced forward medially on anterior margin and at angles, laterally bound by deep grooves, slightly sclerotized posteriorly and here with pair of distinct bristles, for most part leathery, with longitudinal lustrous pattern. Prosternum with dense long rusty hairs on presternum, without noticeably sclerotized sternellem, with two glabrous, leathery, paramedial eusternal sclerites, which are divided anteriorly by broad hairy field that falls slightly short of posterior margin.

Abdomen laterally and around locomotory ampullae covered with comparatively dense rusty hairs. Dorsal locomotory ampullae moderately convex, divided medially by common narrow longitudinal groove, silvery shagreen; disk sometimes with distinct longitudinal streaks (one or two streaks on each ampulla). Ventral locomotory ampullae similar in structure. Body length of mature larvae 15 to 18 mm, width of head 2.8 mm.

Pupa (Figure 26): Differs well from pupa of *X. arvicola* (Oliv.) in location of spinules on pronotum. Head barely convex between antennae, with lustrous longitudinal chocolate-brown stripe in last stage of development, vertex flat, and occiput broadly rounded, lustrous. Antennal apices reach beyond base of hind femora.

Pronotum not longer or slightly longer than wide, broadly rounded on sides, with transverse groove or slight transverse constriction near posterior margin; disk uniformly convex with random minute acicular spinules forming groups; one group in form of narrow transverse stripe toward front, another near anterior margin in form of broad transversely elongate field, and two groups on each side (one in anterior half, the other in posterior half). Mesonotum convex, hyaline, translucent, with angularly produced shield on back side, with minute spinules 52 forming one small group on each side, or without spinules. Metanotum lustrous, convex, with faint median longitudinal groove; disk with two to three minute bristles on each side. Bristles absent in some specimens.

Abdomen comparatively elongate, narrows gradually posteriorly. Abdominal tergites more convex in posterior half. Tergites II to VI with short acute spinules directed backward behind middle, forming jumbled row or narrow crossband. Tergites III to VI with three to six spinules before middle (much smaller in size), forming irregular transverse row. Tergite I with stray minute spinules behind middle and short bristles



50 Figure 26. Pupa of *Xylotrechus antilope* (Schönh.).

forming single transverse row. Tergite VII broadly rounded apically, disk slightly convex; posterior margin with four to five large spinules bent forward and forming transverse row, and two pairs of incurved spinules ahead of this row (of these posterior bristles widely separated and frontal ones closer together); disk with five to six spinules in anterior half directed toward median longitudinal line. Tergite VIII transverse, narrows posteriorly, with four spinules on posterior margin bent forward. Valvifers of female contiguous, wider than long, with distinct round hyaline apical tubercle.

Variability manifested in chaetotaxy. In some beetles spinules form rounded, not elongate field posteriorly on pronotum, are present in small numbers, sometimes with only seven spinules on abdominal tergite VII, of which four bent forward and form transverse row on its posterior margin, two incurved and form transverse row before posterior margin, and one spinule before middle bent toward median longitudinal line. Spinules on tergite VIII uniformly arranged on posterior margin or shifted laterally. Body length 8.5 to 14.0 mm, width of abdomen 3.0 to 3.5 mm.

Material: Collected in southern Ural. Adult insects 14, larvae 12, pupae—two males and two females, larval and pupal exuviae from pupal cells with beetles four.

Distribution: Atlantic coast to southern Ural; north from Scandinavia, Orel, and Ufa south up to the Caucasus, Iran, and the Mediterranean region. Common in deciduous forests of southern Ural.

Biology: Lives in deciduous forests where oak is present. Beetles found from end of June to mid-August. Lead cryptic mode of life. During reproduction found on trunks but more often on shoots of oak. Female oviposits in bark crevices of shoots and on trunk of oak in upper and middle zones.

Larvae live in and under bark, make longitudinal galleries along shoots, and fill them compactly with fine frass. Galleries under bark deeply impressed on alburnum. Pupal cell constructed at end of gallery located longitudinally under bark (deeply impressed on alburnum) or in upper layer of wood. In region of thick bark (on trunk) pupal cells generally made under bark, but in areas of thin bark (on small shoots) made in wood. Length of gallery impressed on alburnum 8.5 cm or more, width of gallery 6.0 to 7.0 mm. Length of pupal cell 20 to 24 mm, width 7.0 to 9.0 mm.

Pupation takes place in June. Maximum number of pupae appear in middle of this month, i.e., almost one week earlier than *X. arvicola* (Oliv.). Young beetles emerge in second half of June. Their emergence from wood begins end of June and is completed toward mid-July. Generation completed in two years. Weight of larvae before pupation (based

on records of 16 larvae during metamorphosis) 34 to 102 mg, pupae 30
53 to 90 mg, young beetles before emergence from wood 26 to 70 mg.

Xylotrechus antilope (Schönh.) develops only on oak, damages young shoots and upper and middle parts of trunk of, usually, large oak trees. We did not find it on other trees. Sometimes *Rhopalopus clavipes* (F.), *Chlorophorus varius* (Müll.), and *Purpuricenus kaehleri* (L.) are found together with this species.

10. **Xylotrechus polyzonus** (Fairm.)

Fairmaire, 1888, *Rev. Russ. d'Entom.*, vol. 7, p. 143 (*Clytus*); Matsushita and Tamanuki, 1935, *Ins. Mats.*, vol. 10, p. 4; Mitono, 1941, *Bull. Agr. For. Taihoku Univ.*, vol. 2, p. 98; =*jeholensis*, Kano, 1935 *Rep. 1st. Sc. Exp. Manchoukuo*, 5, 10, 52, 5; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 249.

Adult (Figure 27): Differs from all other species of *Xylotrechus* Chevr. in elongate body and variegated color of elytra. Head retracted into prothorax almost up to eyes, with dense yellow adherent hairs, and glabrous longitudinal stripe in middle of frons and on vertex. Frons convex, with thin and indistinctly shifted carinae. Space between frontal carinae simple, with sparse stray dots, much narrower than space between carinae and margin of frons. Eyes convex, with narrow notch on inner side, and very minutely faceted. Antennae thicken slightly from base toward apex; 7th segment reaches beyond posterior margin of pronotum. Antennal segments with long apical bristle on inner side; 11th segment apically pointed.

Pronotum slightly longer than wide, rounded laterally, with narrow transverse groove at base, rarely bent anterior margin; disk convex, almost gabled, with dense rugose punctation, adherent yellow hairs, behind which two round black glabrous spots visible on sides, narrow median longitudinal stripe, and transverse black glabrous stripe on posterior slope before transverse groove. Scutellum flat, almost round, with dark adherent hairs.

Elytra with parallel sides, elongate, moderately convex, apically rounded, with highly produced, spinelike outer angle and barely protruding
54 inner angle, with brownish and yellow hairs forming crossband. Anterior yellow band narrow, bent backward medially in form of an angle; second band broad, extends angularly forward along suture and on sides; third band far beyond middle, broad, rounded at anterior margin, concave on posterior margin; fourth band apical, its length not less than width. Legs long; hind femora reach beyond elytral apex, gradually thicken distally from base. Hind tibiae not shorter than femora, much longer than hind tarsi. First segment of hind tarsi 1.5 times longer than two successive segments together. Pro-, meso-, and metasterna with dense

yellow adherent hairs. Abdominal tergites convex, with fine dense punctation, dense yellow adherent hairs, and glabrous at base. Pronotum and head black, abdominal tergites dark brown with rusty tinge. Elytra light rust at base; two blackish-brown sinuous transverse stripes prominent between light-colored hairy bands in anterior half, and two straight and broader transverse stripes in posterior half. Antennae and legs light

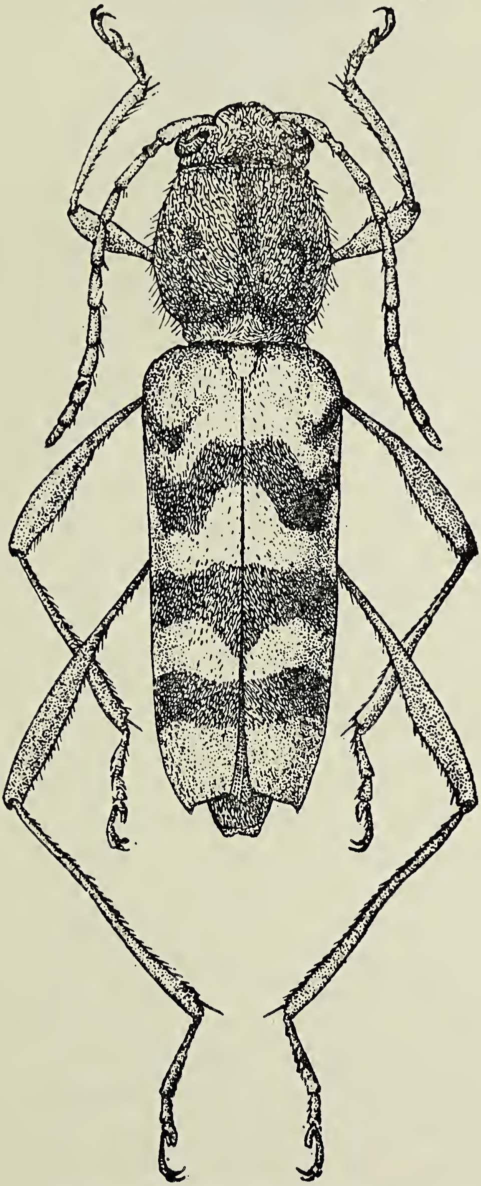


Figure 27. *Xylotrechus polyzonus* (Fairm.).

rust; hind femora lighter colored at base, in second half brownish, darker. Body length 10 mm.

Material: Described on basis of specimen from collection of the Zoological Museum, Moscow State University (environs of Vladivostok, Slavyanka; July 2, 1914—one female).

Distribution: Northeast China, Korean Peninsula; southeastern region of Ussuri-Primor'e. Rare species. We did not find it for many years.

11. **Xylotrechus mixtus** Plav.

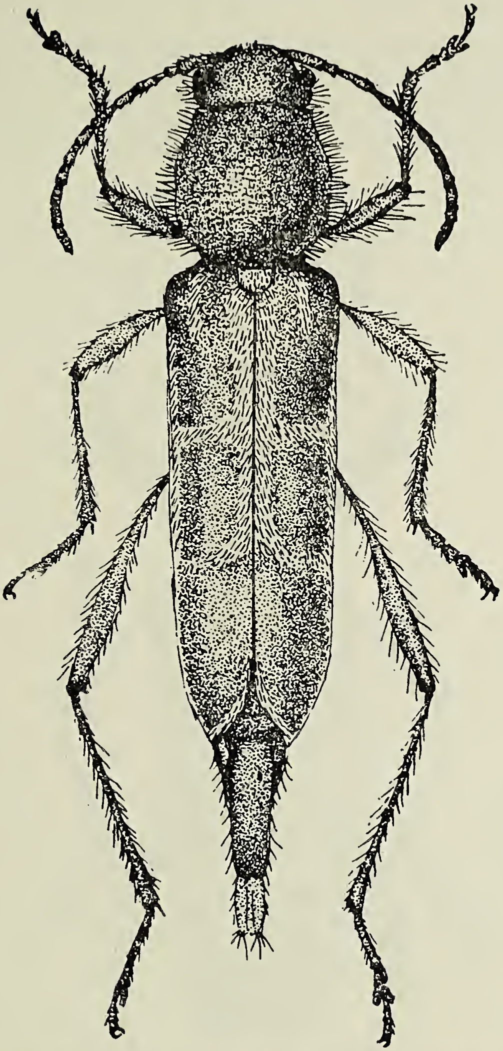
Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 360–362; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 248.

Adult (Figure 28): Body elongate, with parallel sides. Head narrower than pronotum. Frons convex, sides with bent margin, with smooth median longitudinal carinae bound laterally by light-colored hairs bent sideways, and here with fine dense punctation. Vertex with larger fused punctation forming longitudinal folds, and fine setaceous hairs. Occiput with transversely elongate alveolar punctation. Eyes large, flat, with dense white adherent hairs at broad inner notch. Antennae short, notably thicken toward apex, and extend beyond elytral base. First antennal segment almost equal to total length of 2nd and 3rd segments, 3rd segment distinctly longer than 4th, 11th segment apically pointed.

Pronotum oblong, narrows gradually anteriorly, more abruptly and roundly posteriorly, with bent anterior and posterior margins; disk with long coarse transverse folds, sides with shorter folds, and with soft gray hairs directed backward. Scutellum flat, transverse, broadly rounded posteriorly, with fine sparse punctation and sparse light-colored hairs.

Elytra elongate, with parallel sides, convex, with indistinct rounded humeral tubercles, sharp, spinelike, bent outer angle at apex, smoothly truncate on inner side, at base with coarse, in posterior half dense punctation; with semiadherent brownish hairs not forming continuous cover, dense adherent white hairs forming longitudinal white stripe on suture, two transverse stripes connected with marginal narrow longitudinal stripes, and short longitudinal stripe at base, from inner side of humeral 55 tubercle. Body ventrally with semiadherent setaceous hairs. Abdominal sternite V markedly elongate, apically rounded. Hind femora do not reach posterior margin of abdominal sternite III; hind tarsi 0.66 length of tibiae. First segment of hind tarsi 2.0 times longer than two successive segments together. Body and elytra chestnut-brown, with rusty tinge. Antennae and legs dark rust. Body length 14 mm.

Material: Described on basis of just one female specimen caught in Ussuri-Primor'e region (Osinovka, August 5, 1917) and preserved in the Zoological Museum, Moscow State University. Male, larva, and pupa not known.

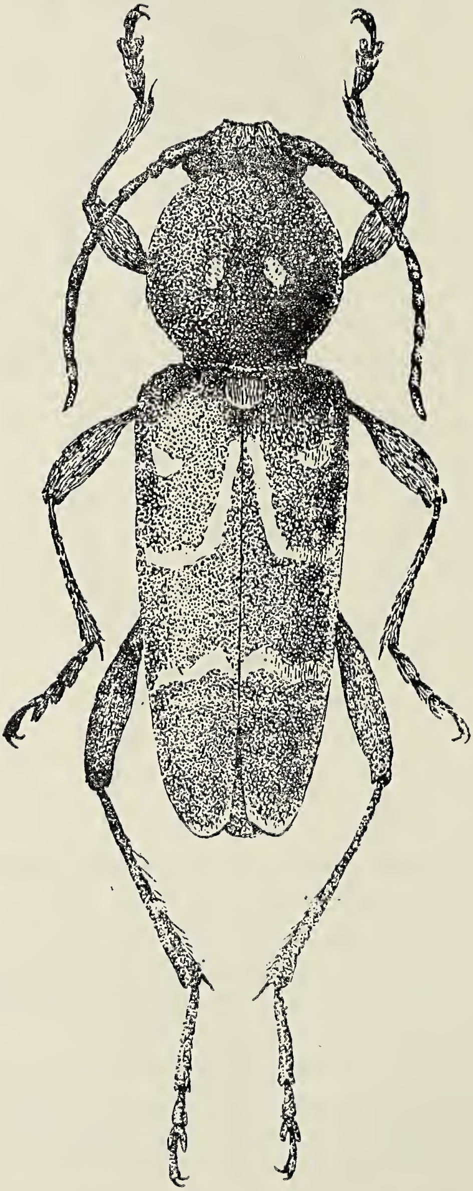


55 Figure 28. *Xylotrechus mixtus* Plav., female (based on type specimen).

12. **Xylotrechus capricornis** (Gebl.)

Gabler, 1830, *Ledebour Reise*, 2, 3, 182 (*Clytus*); Ganglbauer, 1881. In: Best's *Tab. Europ. Coleopt.*, vol. 7, p. 728; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 368–369.

Adult (Figure 29): Characterized by short 3rd antennal segment, minute uniform dense punctation of pronotum, and elytra broadly rounded at apex. Head with uneven punctation, sides of frons with sparse white hairs, notch of eyes with dense adherent hairs, and vertex with minute tubercular hairs. Frontal carinae contiguous, fused in anterior part, distance between them posteriorly not more than lateral part of frons. Vertex without discernible median longitudinal carina, with sharply or barely distinct, finely punctate, matte triangular sclerite along sides. Occiput with sparse large dots. Antennae slender, with apices extending more (male) or less (female) beyond elytral base; 3rd antennal



56 Figure 29. *Xylotrechus capricornis* (Gebl.).

segment much shorter than 1st, equal to either 4th or 5th segments individually.

Pronotum slightly transverse, broadly rounded laterally, disk uniformly convex, and covered with fine dense, comparatively uniform punctation; with minute adherent and thin erect hairs, not forming continuous cover; disk beyond middle with white, paramedial, sometimes dense adherent hairs toward inner side, forming two white spots that in some insects are easily rubbed off. Scutellum with parallel sides or narrows slightly anteriorly, broadly rounded posteriorly, flat, with fine punctation, and white tubercular hairs on posterior margin.

Elytra with parallel sides, moderately convex, entirely broadly rounded apically, with very dense fine punctation, brownish adherent hairs, and bands of white hairs. Legs moderately long; hind femora reach
56 (male) or fall slightly short of (female) elytral apex. Body ventrally with long adherent and erect light-colored hairs. Posterior margin of abdominal sternites I to III with white sinuate border laterally. Metathorax and episternum without white hairy cover. Body black or blackish-brown. Body ventrally, especially abdomen, with rusty tinge. Antennae rusty or rusty-brown, with darker apex. Legs rusty, rusty-brown, or almost black, only base of femora and tarsi light colored, slightly rusty. Elytra black or blackish-brown, with rusty border encircling scutellum posteriorly, and with two white crossbands. One small white hairy spot behind humeri in anterior third of elytra; anterior crossband before middle extends by inner margin toward scutellum and turns or sometimes does not turn forward on sides; second white hairy and slightly curved crossband before posterior slope; border of white hairs sometimes perceptible at apex, often lacking (f. *typica*). Rarely, posterior white band medially interrupted (ab. *ješatkoi* Heyr.). Body length 8.0 to 14.0 mm.

Material: Collected in sourthern Ural. Adult insects two.

Distribution: Eastern Alps to Ural. Rarely found elsewhere.

Biology: Inhabits deciduous forests. Ecologically associated with deciduous trees. Beetles fly in June and July. Larvae and pupae not known.

13. **Xylotrechus arnoldi** Kost.

Kostin, 1974, *Entomol. Obozr.*, 53, 3, 647–648.

Adult (Figure 30): Characterized by small size, brownish body, sparse grayish hairy coat, and faint crossbands on elytra. Head short, its width slightly narrower than pronotum, markedly retracted into prothorax. Frons laterally compressed, with carinate, produced margin near antennal base. Frontal carinae diverge backward, lustrous, slightly convex; space between carinae covered with sparse dots. Frons between frontal
57 carinae and lateral margins, as well as vertex, with gray adherent hairs. Vertical sclerites (male) with fine punctation, matte, completely darken-

ed, protrude slightly; lateral sclerites oval (indistinctly triangular). Eyes large, with minute facets, deeply notched, crescentoid. Inner margin of ocular suture with dense adherent gray hairs. Genae with relatively dense punctation, with gray adherent hairs, length slightly more than width of lower lobe of eyes. Antennae thick, short, with apices rarely extending beyond posterior margin of pronotum, with fine punctation and sparse semiadherent hairs. Third antennal segment longer than 4th, slightly shorter than 1st segment; 11th segment apically pointed.

Pronotum slightly wider than long, uniformly rounded laterally, disk convex, with insignificant flat depression on sides, with fine and very dense punctation, and gray and brownish setaceous hairs. Scutellum flat, broadly rounded posteriorly, with dots, and sparse gray adherent hairs.

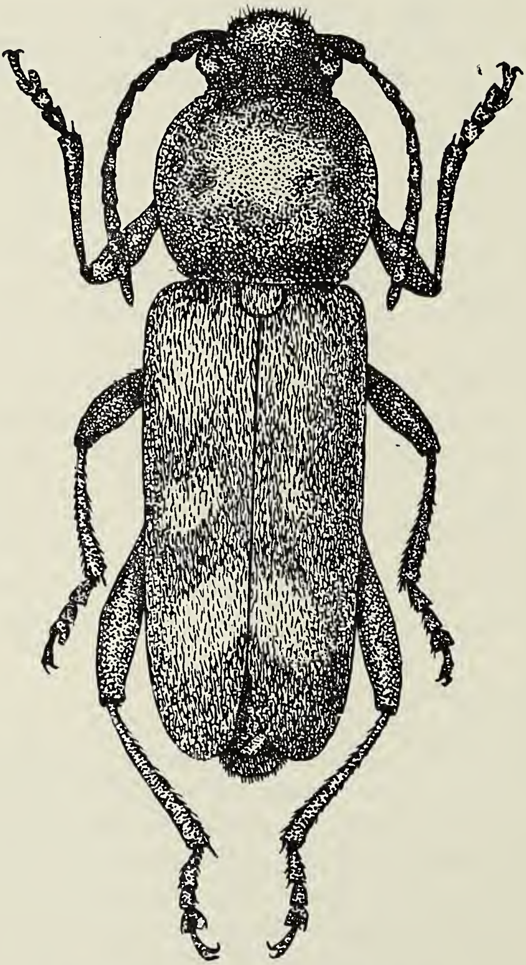


Figure 30. *Xylotrechus arnoldi* Kost.

Elytra with parallel sides, convex, uniformly rounded posteriorly, with smoothly rounded humeri; fine and very dense punctation, and gray adherent hairs forming faint crossbands. One crossband lateral before middle, the other beyond middle before posterior slope. Legs comparatively thick, not very long; hind femora distinctly do not reach elytral apex. Hind tarsi shorter than tibiae; 1st segment almost 1.5 times longer than two successive segments together. Body ventrally with dark gray adherent hairs. Abdominal sternites with sparse fine punctation. Abdominal sternite V in male broadly rounded posteriorly, in female more elongate. Body dark brown. Elytra light colored, with rusty tinge. Antennae and legs with rusty (reddish-brown) tinge. Body length up to 8.0 mm.

Material: Collected at foothill of Kokshetau mountain in northern Kazakhstan. Adults three (collection of the Zoological Institute, Leningrad).

Biology: Inhabits open areas. Judging from collections, lives on goosefoot. Larvae develop in rhizome of this plant. Adults begin to emerge in June. Rarely found. Based on ecological associations and morphological characters, close to *Xylotrechus zaisanicus* Plav. One may
58 assume that these two species have a common origin and evolved side by side—one in northern Kazakhstan in the Kokochetav steppes, the other species south, in the area of the Semirech's steppes.

14. **Xylotrechus rufilius** Bat.

Bates, 1884, *J. Linn. Soc. Lond. Zool.*, vol. 18, p. 233; = *irinae*, Plavilstschikov [Plavil'shchikov], 1925, *Entom. Mitteil.*, vol. 14, p. 360; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 362–364; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, pp. 250–251; Kojima and Okabe, 1960, *Food Plants of Jap. Cerambycidae*, vol. 27, p. 136.

Adult (Figure 31): Differs well from all other species of this genus in large coarsely punctate red pronotum, short elytra, and long hind legs. Head with large, comparatively dense punctation on vertex, sparse punctation on occiput; sides of frontal carinae with sparse, ocular suture very minute adherent grayish hairs, vertex with sparse short brownish hairs. Frontal carinae thin, widely shifted backward, fuse toward front. Vertex with long median longitudinal, more or less bifurcate carina, which extends far ahead between frontal carinae. Antennae slender, with short adherent hairs; 8th or 10th segment reaches beyond elytral base; 4th segment equal to 5th, much shorter than 3rd.

Pronotum large, barely narrower than elytra, disk hemispherically convex, with large dense punctation and here transverse, more sclerotized folds, and broadly rounded, laterally with fine dense deep dots, between which fine sclerotized folds or tubercles barely perceptible; disk with

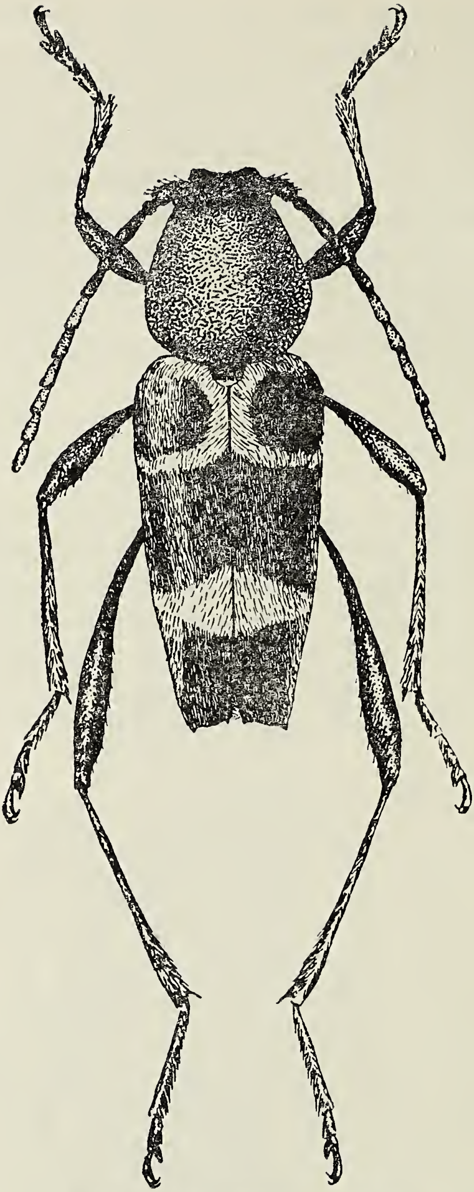


Figure 31. *Xylotrechus rufilius* Bat.

dark brown, sides with light-colored short hairs; anterior margin with more, posterior margin less produced smooth edge. Scutellum transverse, almost semicircular, with dark brown hairs at base and light-colored whitish hairs at apex.

Elytra short, length only 2.0 times total width at humeri, markedly nar-
59 row toward apex, disk moderately convex, with dense punctation, dense

adherent dark brown hairs, dense white hairs in crossband, transversely truncate apically, and with slightly produced angles. Hind legs long; hind femora more (male) or less (female) reach far beyond elytral apex. Head and scutellum black. Pronotum red, with partly dark anterior and, sometimes, dark posterior margin. Antennae and legs dark brown, with rusty tinge. Body ventrally dark brown or dark chestnut. Sides of metathorax, posterior half of episternum, and posterior margin of abdominal sternites I and II with dense adherent white hairy coat; abdomen and middle of metathorax with thin erect brownish hairs. Elytra dark brown, almost black; base and suture behind scutellum in anterior part with white border that converts into transverse hairy white band before middle; broad white band before posterior slope narrows and becomes cuneiform laterally, and thus here covered with white hairs.

Xylotrechus irinae Plav., described earlier, and distinguished by short dark carina, should be considered a variant of this species because its distinguishing character is rather variable. Body length 8.0 to 13.0 mm.

Egg: White, elongate, rounded at poles. Chorion smooth, without perceptible alveolate sculpture. Length 1.8 mm, width 0.6 mm.

Larva (Figure 32): Based on structure of pronotal shield, close to larva of *X. antilope* (Schönh.). Differs well in basally sclerotized gular plate and vertex with aristate whitish process on parietals behind antennae. Body slightly elongate, white. Head narrowly rounded anteriorly,
60 markedly retracted into prothorax. Epistoma convex, lustrous, anterior margin with dark brown or rusty border, behind which short minute hairs form faint crossband, with barely perceptible apical longitudinal suture, and laterally fuses with parietals. Frontal sutures not visible. Hypostoma narrows slightly toward base, slightly convex, whitish, anterior margin straight, without visible notch, with narrow lustrous rusty border. Gular plate transverse, with rounded sclerotized basal margin. Parietals dark rust in anterior half and light rust in posterior half, with three light-colored aristate hairs behind antennae forming transverse row, with one light-colored (nonpigmented) ampullar ocellus near antennal base. Antennae long; apices reach beyond anterior margin of cephalic capsule. First antennal segment thick, narrows toward apex; subsequent segments slender, of which 3rd brownish, 2nd light colored. Clypeus translucent, trapezoid, and broadens markedly at base. Labrum small, broadens behind middle, narrows anteriorly and posteriorly, whitish, and with rusty bristles in anterior half. Mandibles black, reddish-rust at base, rounded at apex, and with deep outer median longitudinal grooves near base. Inner lobes of maxillae significantly shorter than maxillary palps, apically rounded and whitish, with thin light-colored bristles.

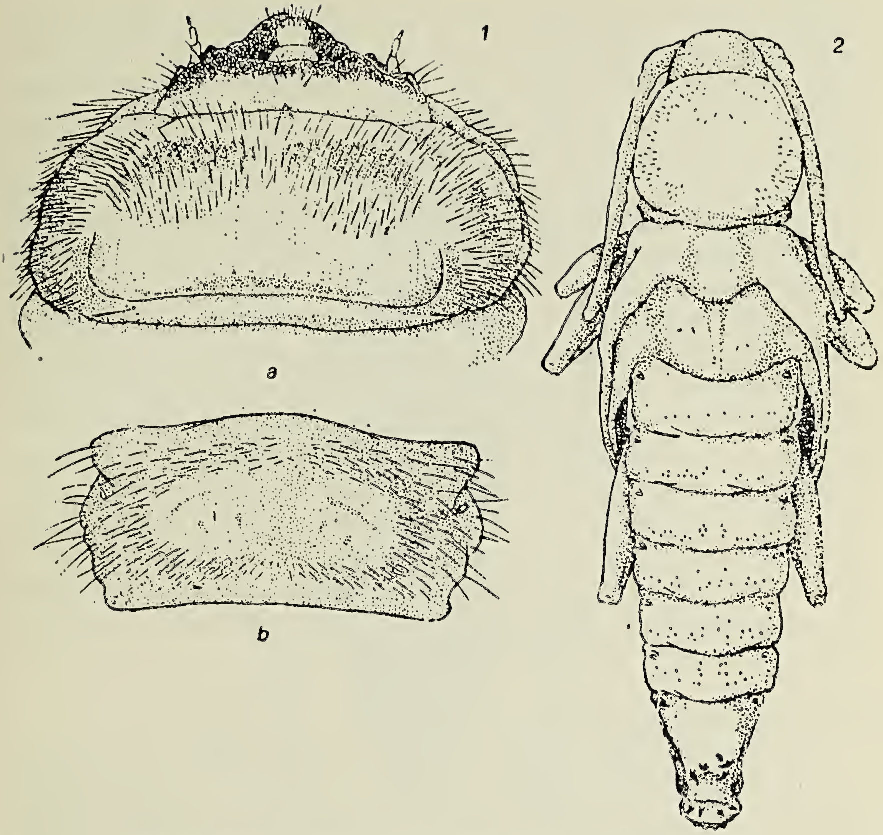
Pronotum convex, width 2.0 times length, with dense rusty hairs in anterior half and on sides, two transversely elongate yellow spots in anterior third of disk, and glabrous lustrous yellowish sclerite laterally. Pronotal shield white, with deep longitudinal striation, posteriorly with fine silvery sculpture, laterally with deep groovelike longitudinal folds, medially with narrow longitudinal groove, two distinct notches in anterior margin, which is medially and at anterior angles acutely produced forward. Prosternum with dense uniform rusty hairs on presternum, two round glabrous eusternal sclerites divided by broad hairy nonsclerotized field. Meso- and metasterna with fine rusty hairs in anterior half forming crossband.

Abdomen narrows gradually from thorax toward tip, with short rusty hairs laterally. Dorsal locomotory ampullae on abdominal tergites I to VII convex, with shagreen sculpture, coriaceous, with lateral oblique groovelike depression (especially on tergites V to VII), and with common indistinct channel-shaped groove medially. Ventral locomotory ampullae insignificantly convex, with shagreen sculpture, and medially divided by common longitudinal groove. Segment VII with narrow constriction posteriorly, its posterior margin appears produced in form of ridge. Tergite IX very short, its length about 0.25 width, posterior margin with fine rusty hairs forming crossband. Body length 16 to 18 mm, width of head 2.5 mm.

Pupa (Figure 32): Similar to pupa of *Xylotrechus antilope* (Schönh.). Differs in more elongate abdominal tergite VII. Head lustrous on occiput, hemispherical, without bristles, and frons raised and somewhat flat on sides. Antennae flexed to sides, with apices adjoining elytral base.

Pronotum convex, rounded laterally, notably narrower anteriorly, without transverse groove posteriorly, with barely bent thin posterior margin, and faint lateral longitudinal depression on posterior slope; laterally in anterior half and on posterior slope near lateral depression with sharp acicular spinules forming distinct groups. Mesonotum with-
61 out spinules, depressed or saddlelike in middle part. Metanotum slightly convex, with narrow longitudinal groove anteriorly, distinct transversely truncate posterior margin, without spinules.

Abdomen elongate, narrows in posterior half toward tip. Abdominal tergites moderately convex, with narrow median longitudinal groove, and sharp spinules in posterior half forming narrow uneven crossband or transverse jumbled row. Abdominal tergite VII elongate, length more than width at base, with five large spinules bent forward in posterior half forming uneven transverse row, closer to middle with two pairs of sharp subulate spinules forming two transverse rows. Tergite VIII transverse, disk with four large sharp erect spinules. Tip of abdomen slightly rounded. Valvifers of female hemispherical, with small apical tubercle. Body length 13 mm, width of abdomen 3.0 mm.



59 Figure 32. Larva (1) and pupa (2) of *Xylotrechus rufilius* Bat. a—head and pronotum; b—abdominal tergite IV with dorsal locomotory ampulla.

Material: Collected in Ussuri-Primor'e region and from Kunashir Island. Adult insects one, larvae 13, pupae—females. Collections of the Zoological Museum, Moscow State University, Moscow and the Zoological Institute, Leningrad were also examined.

Distribution: Ussuri-Primor'e region, Sakhalin and Kunashir Islands; Japan, northeast China, Korean Peninsula.

Biology: Inhabits deciduous forests. Beetles emerge in July. Female lays eggs in bark crevices singly or in batches. Fully formed larvae, often without leaving chorion, bore bark. Chorion filled with frass. Larvae live under bark, make longitudinal, rarely transverse, meandering galleries, and fill them with fine frass. If eggs laid in batches, larvae orient in different directions, leaving behind radial galleries on alburnum and in bark (on inner side). Galleries may or may not be impressed on alburnum. Last-instar larva returns to cork layer, makes pupal cell, usually longitudinal to trunk, and pupates inside it with head toward trunk surface.

Length of gallery under bark up to 29 cm, width initially from 1.0 mm, terminally 12 mm. Some larvae bore wood before pupation, with opening on surface 13.0 mm × 3.0 mm. They make pupal cell in wood longitudinal to trunk, cut exit into bark, and fillit with frass. Pupation takes place with head toward exit. Length of pupal cell 15 to 19 mm, width 5.0 to 7.0 mm. Thickness of bark layer between surface of trunk and exit of pupal cell 2.0 mm. Pupae are found in nature end of June and in July. Weight of six larvae before pupation 67 to 93 mg. Generation completed in two years.

Xylotrechus rufilius Bat. is found comparatively rarely. We found it once on maple (*Acer pictum*) near Lazo Village. According to published reports (Gressit, 1951; Kojima and Okabe, 1960), larvae of this species live on *Ulmus parvifolia*, *Fraxinus siboldiana*, and *F. mandshurica*. Density of larval population on tree trunks is relatively high. For example, eight larvae were collected from an area 32 cm × 10 cm on a maple tree. When the bark was removed from the trunk, impressions of larval galleries filled with frass remained on the alburnum on the inner side of the bark. This species inhabits drying and freshly fallen trees. In 1980 we found a maple tree inhabited by larvae of two generations, which had emerged from eggs in 1979 and 1980.

62 15. **Xylotrechus pavlovskii** Plav.

Plavilstschikov [Plavil'shchikov], 1954, *Zool. Zhurn.*, 33, 2, 471–473.

Adult (Figure 33): Characterized by narrow space between frontal carinae, presence of four light-colored hairy spots on pronotum, reddish-rust base of elytra and characteristic pattern on them. Parietals with dense, moderately large punctation from frontal carinae, large rounded flat dots on vertex (space between them narrow), white hairs forming spots along sides of frontal carinae, toward the eyes, and on lower part of the parietals. Frontal carinae broad, fused in anterior half, displaced in posterior half, with slightly squarrose, longitudinally elongate punctation; space between carinae narrow, groovelike. Antennae extend beyond elytral base by 8th (male) or 9th (female) segment, with fine adherent brownish hairs; 3rd segment shorter than 1st, slightly longer than 4th, equal to 5th or slightly longer.

Pronotum slightly longer than maximum width, broadly rounded behind middle, narrows smoothly anteriorly, more abruptly posteriorly, convex, with deep dense and on disk larger punctation, with distinct transverse median folds; adherent brownish hairs do not form compact cover; pair of light-colored, transversely elongate hairy spots in anterior half, pair of larger spots behind middle, and longitudinal white broad border laterally. Scutellum broad, broadly rounded posteriorly, and with fine punctation.

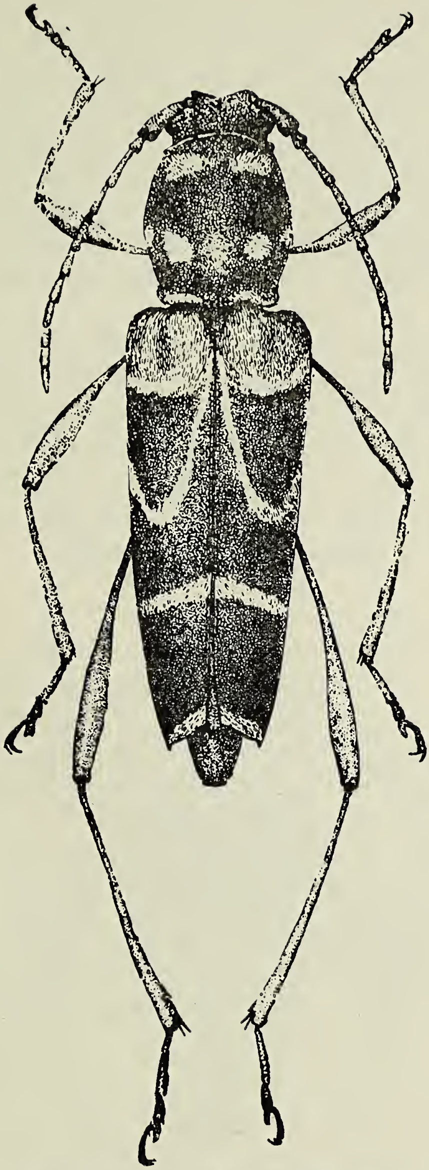


Figure 33. *Xylotrechus pavlovskii* Plav.

Elytra moderately elongate, narrow insignificantly toward apex, apically truncate toward inner side, with produced, spinelike outer angle and rounded inner angle, slightly convex, with fine dense punctation, and fine brownish hairs. Legs long, hind femora extend far beyond elytral apex. Lower side with light-colored erect hairs, posterior margin of metasternum and metathoracic episternum with dense yellowish hairy

cover anteriorly, forming common border here; abdominal sternites with broad yellow hairy border on posterior margin. Legs rusty-yellow. Ely-
63 tral bases reddish-brown in basal half, remainder black with hairy crossbands: first band short, behind humeri, on outer margin turns slightly forward; second band in middle, arcs toward scutellum abruptly on inner margin, extends forward here beyond first band, and on outer margin turns forward slightly; third band behind middle, extends from suture toward lateral margin but falls slightly short of it, and slightly truncate behind. Elytral apex with narrow white hairy border. Body length 9.2 to 11.0 mm.

Material: One male and one female collected in Ussuri-Primor'e region in environs of Sokolovka Village (collections of the Zoological Museum, Moscow State University). Larvae and pupae not known.

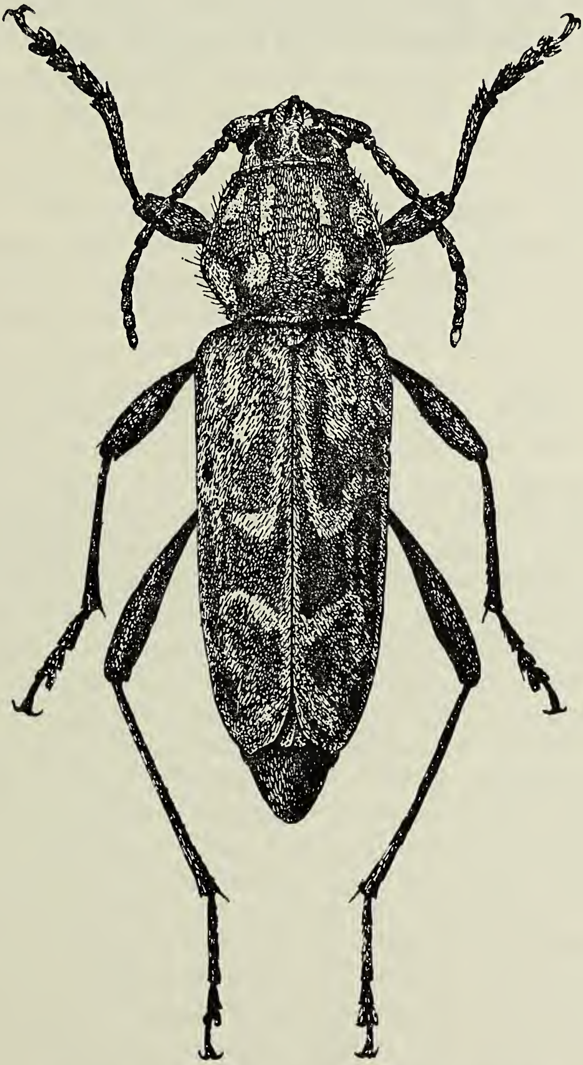
Biology: Known on the basis of two specimens captured on an oak stem on July 20th. One can only assume that the species inhabits deciduous forests, and is ecologically associated with oak. Emergence of adults takes place in July.

16. **Xylotrechus nadezhdae** Tsherepanov, sp. n.

Adult (Figure 34): Based on general dimensions and elytra rounded at apex, similar to *X. rusticus* (L.). Differs notably in tender hairy pattern on elytra and other characters. Head narrower than prothorax. Frons notched laterally, with curved smooth border, soft grayish-yellow hairs directed sideways, fine punctation, smooth backwardly directed carinae that do not continue beyond antennal base, faint thin median longitudinal carina, and distance between frontal carina and lateral margin of frons slightly less than width of space between carinae. Sclerites of vertex sharply distinct in male, with fine sculpture, matte. Vertex of female with two longitudinal yellow hairy stripes. Parietals with dense short adherent yellow hairs. Eyes very minutely faceted, broadly notched in upper inner part. Antennae with long adherent hairs on lst to 6th segments, short brownish hairs on 7th to 11th. First antennal segment moderately thick, not shorter than 3rd, and distinctly longer than 4th.

Pronotum distinctly longer than wide, narrows gradually from posterior end toward apex, but abruptly in posterior third, with large transverse rugose punctation; disk with four small, longitudinally elongate, yellow hairy spots (two in anterior half and two in posterior half at a greater distance), with longitudinal stripe or two minute yellow hairy spots along sides, in middle (between posterior pair of yellow spots) with faint longitudinal stripe of white hairs. Mesonotum with large yellow hairy spot laterally. Scutellum broad, semicircular, with sparse white adherent hairs.

Elytra with parallel sides, highly convex, with smooth humeri, apically rounded or slightly truncate toward suture; with dense fine uneven punctation forming transverse rugulose pattern, and white adherent hairs forming characteristic ornamentation of three longitudinal stripes, transversely elongate spots, and bands. One longitudinal stripe extends along suture from scutellum to posterior elytral slope, second along side from humeral tubercle to apex, and third along edge from base up to elytral apex. Prosutural and lateral stripe converge into spot in anterior third, medially transverse, in posterior half obliquely directed forward as band;



64 Figure 34. *Xylotrechus nadezhdae* Tsher., female.

lateral and marginal stripes anastomose basally in middle and posterior
64 third. Consequently three black glabrous, longitudinally elongate platforms on sides and four platforms on elytral disk visible between white hairy longitudinal stripes and crossbands. Body ventrally with fine dense punctation, and uniform adherent whitish-gray hairs. Abdominal sternite V narrowly rounded posteriorly. Tergite V exposed on upper side, not covered by elytra, narrows more (female) or less (male) posteriorly, dorsally rounded (male) or with narrow notch (female), disk with stray white adherent hairs. Legs comparatively long, with sparse adherent white hairs. Femora thickened in second half, reach elytral apex (male) or fall short of it (female). Hind tarsi slightly shorter than tibiae, their lst segment distinctly longer than all successive segments together (including claw). Body, elytra, and legs black. Antennae black, with brownish-rust tinge on 2nd segment. Claws reddish-rust, contrasting markedly with black tarsal segments. Body length 17 to 24 mm.

Egg: White, elongate, rounded at poles. Chorion smooth, lustrous, without visible sculpture. Length 2.0 mm, width 0.6 mm.

Larva (Figure 35): Differs well from larvae of other species in large rounded spiracles with dark rusty outline, presence of dense rusty hairy cover on sides of body, structure of labrum, and other characters. Body white. Head narrowly rounded anteriorly and markedly retracted into prothorax. Epistoma convex, with broad and notably convex dark brown border on anterior margin, behind which short setaceous hairs form transverse row; apex with faint longitudinal suture, sides fused with parietals, frontal sutures indistinct. Hypostoma slightly convex, with parallel sides, rounded at anterior outer angle, with narrow rusty border on anterior margin, and smooth notch near inner angles of sclerites. Gular plate slightly notched on anterior margin and here with rusty bor-
65 der; broadens toward base. Parietals with broad border on anterior margin covering ocellar-antennal area; setaceous hairs form transverse row or stripe. Antennae comparatively long, apices markedly extending beyond anterior margin of cephalic capsule. Second to 3rd segment with brownish tinge. Ocellus on lower side, near antennal base, light colored, ampullar, and distance between it and antennal socket 0.50 diameter of ocellus itself. Clypeus trapezoid, translucent, flattened at base. Labrum oblong, oval, with lustrous glabrous median longitudinal groove, and laterally with dense long rusty bristles. Mandibles massive, broadly rounded at apex, black, reddish-rust at base, with median longitudinal groove. Submentum of labium with sharply produced anterior angles. Mentum transverse, extended at base, and laterally with numerous rusty bristles. Inner lobes of maxillae much shorter than maxillary palps, brownish, whitish at apex and here with short rusty bristles.

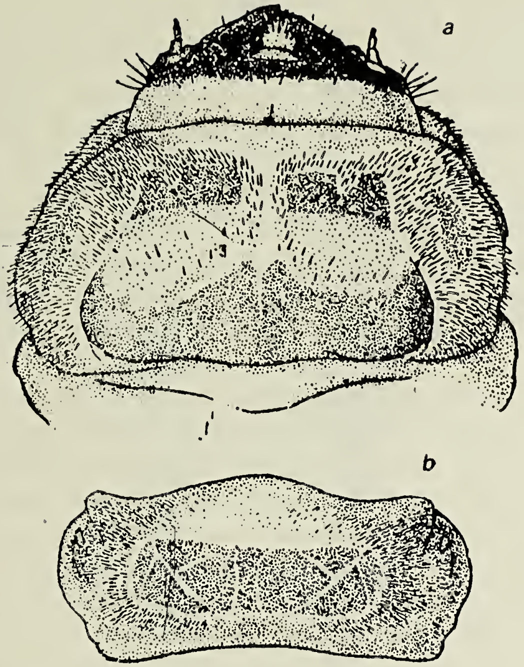


Figure 35. Larva of *Xylotrechus nadezhdae* Tsher.
a—head and pronotum; b—abdominal tergite IV
with dorsal locomotory ampulla.

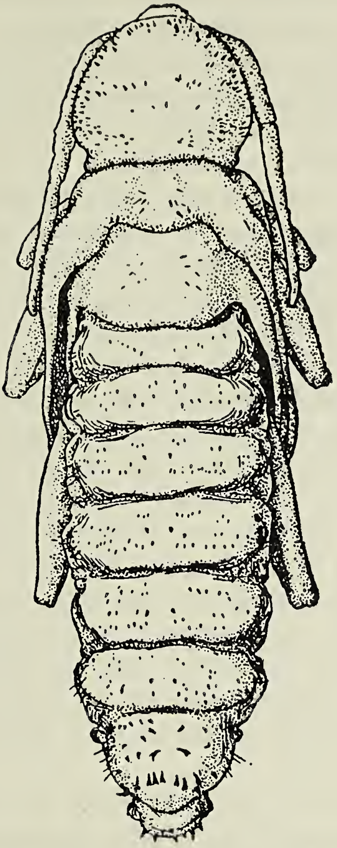
Pronotum narrowly rounded anteriorly, slopes markedly toward head, with pair of square yellow spots in anterior third (divided by broad white field and one longitudinally elongate white notch on anterior margin); laterally with oval glabrous yellow spot and dense short rusty hairs. Yellow spots on disk and on sides with numerous deep minute whitish dots. Pronotal shield convex, with yellowish-rust tinge, highly sclerotized (covered with minute and dense spinules), with small longitudinally elongate dots, bidentate anterior margin with sharp anterior angle, latter with narrow longitudinal groove, and bound laterally by 66 short deep longitudinal folds. Alar lobes, on outer side of these folds, with minute sclerotized spinules. Meso- and metanota laterally with dense short rusty hairs, medially with minute spinules visible under high magnification. Prosternum convex on lower side, with dense uniform short rusty hairs on presternum; eusternum with pair of lustrous glabrous rounded or longitudinal and slightly produced sclerites separated by broad hairy field. Posteromedially basisternum and greater part of sternellum with dense and very small spinules. Meso- and metasterna with dense minute spinules in posterior half, short rusty hairs in anterior half and along sides. Thoracic legs lacking.

Abdomen thick, laterally with dense short rusty hairs. Dorsal locomotory ampullae convex, entirely covered with dense minute spinules, median channel-shaped longitudinal groove, and longitudinal, slightly outcurved lateral fold. Ventral locomotory ampullae convex, transversely elongate, entirely sclerotized (covered with dense minute spinules), with median constriction, and faint transverse groove in posterior half connected with longitudinal alveolar lateral fold. Tip of abdomen with dense short rusty hairs. Tergites VIII to IX with narrow glabrous median longitudinal stripe. Spiracles very large and broad, with dark rusty contour; length of spiracle on abdominal segment I—2.0 times, on other segments 1.5 times width. Body length 20 to 25 mm, width of head 3.5 to 4.0 mm.

Pupa (Figure 36): Highly resembles pupa of *X. cuneipennis* Kr. Differs in larger acute spinules on abdominal tergites, smaller number of spinules on pronotum, and presence of large number of spinules at apex of abdominal tergites VII. Body elongate. Head narrows slightly from antennal base toward front, transversely convex between antennae, flat on vertex, narrowly rounded on occiput, glabrous, without bristles. Antennae flexed to sides, short, with apices barely reaching alar base.

Pronotum rounded laterally, narrows anteriorly somewhat, with faint transverse groove at base, and uniformly convex on disk; numerous sharp, rusty aristate spinules on anterior margin and near posterior angles of posterior slope from common spinescent field around circumference, which is medially interrupted only posteriorly. Pronotal disk almost glabrous, with stray minute spinules only in middle. Mesonotum convex, with broadly rounded posterior margin, with minute paramedial rusty bristles forming group on each side. Metanotum slightly convex, with faint median longitudinal groove, broadly rounded posterior margin, and sparse, barely perceptible bristles laterally.

Abdomen convex, narrows faintly toward base and gradually toward tip. Abdominal tergites convex, with narrow median longitudinal groove. Tergites I to II with very minute aristate spinules forming crossband on each. Tergites III to VI with large acute spinules bent backward; anterior half with minute sharp reddish-rust spinules forming two crossbands on each; one closer to posterior margin, the other closer to anterior margin. One large spinule bent backward occurs between these crossbands alongside longitudinal groove immediately behind middle of tergite. Tergite VII much shorter (male) or slightly longer (female) than width at base, disk convex, with broadly rounded posterior margin; latter with eight to eleven, rarely six, large spinules bent forward, forming uneven transverse row; disk with pair of similar large and short
67 spinules bent toward middle in first half and lacking very large and minute spinules directed backward. Tergite VIII transverse, with eight



65 Figure 36. Pupa of *Xylotrechus nadezhdae* Tsher.

to eleven large spinules on posterior margin directed upward and forming transverse row; disk with hairy bristles on sclerotized base (in other species of *Xylotrechus* Chevr., usually four to five large spinules present posteriorly on abdominal tergites VII to VIII, which are bent forward). Tip of abdomen rounded, with narrow horseshoe-shaped smooth ridge. Valvifers of female large, highly contiguous, hemispherical, with distinct apical tubercle. Body length 16 to 25 mm, width of abdomen 4.0 to 5.0 mm.

Material: Collected in Ussuri-Primor'e region (Sokol'chi, Karpat' cordon of Lazovskii reserve). Adults 10, larvae seven, pupae—one male and two females, larval exuviae with beetles six. Pupae and adults obtained from larvae collected in nature.

Holotype (male, p. 91, sheet 10, Jan. 7, 1981) and paratypes preserved in collection of the Biological Institute, Siberian Branch, USSR Academy of Sciences.

This species is named after Nadezhda Epifanova Cherepanova, who described its life cycle under laboratory conditions.

Distribution: Southern tip of Sikhote-Alin' mountain.

Biology: Inhabits deciduous plantations. Found on Maximovich poplar (*Populus maximoviczii*). Beetles sighted in July. Females oviposit in bark crevices. In the laboratory a female once laid a batch of 58 eggs on paper in a glass tube. Ovaries of one female before oviposition contained 166 eggs. Egg development under experimental conditions at 16.0 to 23.5°C (average 20.4°C) continued for 14 to 16 days, average 15.2 days. We had placed 87 eggs under observation. Larvae initially live in bark, thereafter under bark. They make broad sinuous, sometimes flat galleries, impressed on alburnum. Galleries filled with fine frass of bark and wood. Larvae after first hibernation in July large and live under bark. Before second hibernation they bore into wood, leaving outlet on surface filled with frass. Width of outlet varies from 0.7 to 1.9 cm. Larvae initially make transverse, then longitudinal galleries in wood, and fill them with fine frass. Pupal cell made at end of gallery, longitudinal to trunk in upper layer of wood at depth of up to 2.0 to 3.0 cm, and exit cut on outer side filled with frass. Larva pupates in cell with head toward exit. Length of gallery in wood 6.0 to 11.0 cm, width 10.0 mm. Length of pupal cell 20 to 40 mm, width 7.0 to 8.0 mm. Width of exit filled with frass 5.0 to 9.0 mm. Sometimes larvae do not bore wood and make pupal cell in bark. Larvae pupate in June, possibly also beginning of July.

Pupation continues for about three weeks. At 18.7 to 23.0°C (average 20.5°C), one beetle emerged after 19 days of pupation, at 23 to 25°C another after 18 days of pupation. During metamorphosis insect weight decreases notably. For example, a single larvae before pupation weighed 286 mg (100%), pupa (male) developing from it 254 mg (88.8%), and beetle emerging from pupa 182 mg (63.6%), i.e., the overall reduction in weight during metamorphosis was 36.4%. In another case (female) weight reduction was 40.7% (weight of larva before pupation 684 mg, pupa 526 mg, and beetle 406 mg). Average weight of larvae (based on 14 larvae) 150 to 684, mg, pupae 102 to 526 mg, and beetles before emergence from wood 89 to 406 mg. Fully formed beetles push frass aside and emerge from pupal cell. At time of their emergence from pupal cells beetles have well-developed gonads and require no additional feeding. Reproduction commences soon after emergence from wood. Generation completed in two years.

Xylotrechus nadezhdae Tsher. inhabits thick trunks with thick bark. 68 We found larvae on freshely cut branches of Maximovich poplar (diameter of trunk about 50 cm). They occupied the lateral sector of the trunk (length up to 125 cm and width 40 cm) and were not found in other parts of the trunk, nor on other fallen trees. Density of inhabitation comparatively high. For example, 14 larvae were found in an area 30 cm × 20 cm, and nine larvae before pupation in another area 22 cm × 20 cm. *Saperda alberti* Plav. was found together with this species on the same trees.

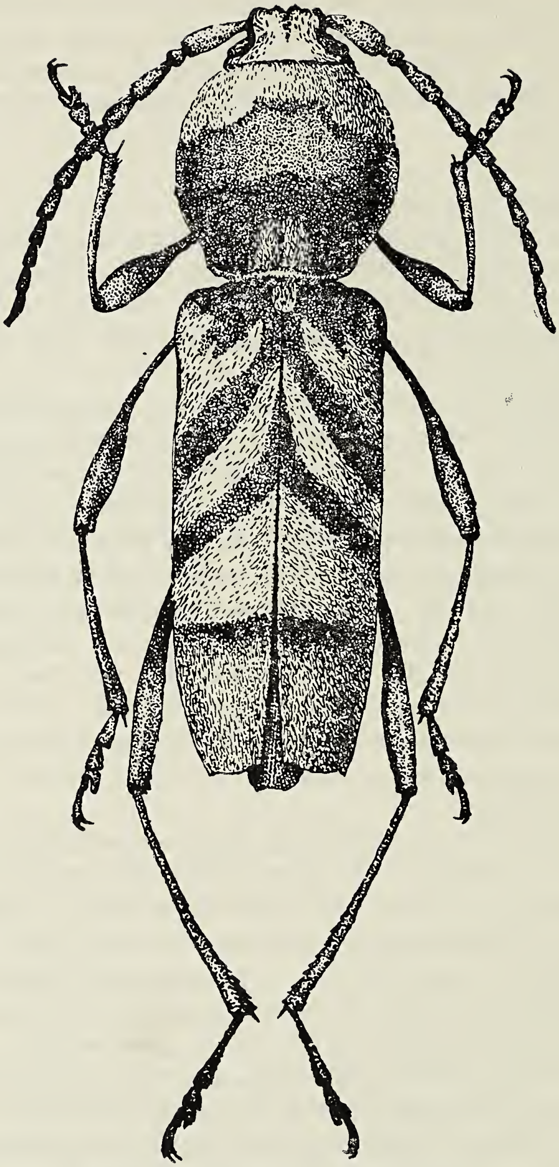
17. **Xylotrechus chinensis** (Chevr.)

Chevrolat, 1852, *Rev. Mag. Zool.*, 2, 4, 416 (*Clytus*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 341–343; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 238; Kojima and Okabe, 1960, *Food Plants of Jap. Cerambycidae*, vol. 27, p. 23; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 75.

Adult (Figure 37): Similar to *X. villioni* Vill. Differs well in truncate apex of elytra and other characters. Head retracted into prothorax almost up to posterior margin of eyes, and with dense yellow adherent hairs. Frons broad, with parallel sides, and barely produced margin near antennal base. Frontal carinae slightly convex, narrowly separated; space between them groovelike, less than space between carina and lateral margin of frons. Eyes moderately convex, very minutely faceted, deeply notched; notch with dense compactly adherent yellow hairs. Antennae thick at base, narrow toward apex, bristle shaped, with rusty hairs; 7th segment extends beyond pronotal base; 4th segment barely shorter than 3rd, equal to 5th or even shorter; 6th to 10 segments with rounded apical margin; 11th segment slender, elongate, with faint median constriction, and apically pointed.

Pronotal disk convex, almost hemispherical, uniformly rounded on sides, narrows somewhat toward base, with very dense fine punctation;
69 dense compactly adherent yellow hairs from broad continuous transverse stripe at anterior margin and large semicircular spot posteriorly before scutellum; remaining part of pronotum with minute indistinct hairs. Scutellum triangular, narrowly rounded anteriorly, flat, with fine punctation and dense adherent yellow hairs, glabrous only at base. Elytra elongate, barely narrow posteriorly, disk convex, with abruptly rounded humeri, short longitudinal notch on inner side near base, truncate at apex, with produced, spinelike angles, fine dense punctation, posterior slope with sparser punctation, and brownish (between crossbands) and with dense (on crossbands) adherent hairs.

Legs long; hind femora extend beyond elytral apex. Metasternum with dense fine punctation and semiadherent brownish hairs. Episternum of metathorax with dense adherent yellow hairy coat in posterior third. Abdominal sternites with dense adherent yellow hairs and glabrous rusty border on posterior margin. Body black, antennae and legs rusty, bases of femora black. Pronotum with transverse rusty stripe anteriorly.



68 Figure 37. *Xylotrechus chinensis* (Chevr.).

Elytra dark brown, with transverse rusty or light-colored hairy bands (anterior one narrow and straight, originating from scutellum obliquely backward toward lateral side; middle band extends from suture and curves back toward lateral margin up to middle of elytra; posterior band, before posterior slope, broader, transverse, and extends forward toward suture at an angle); apex of elytra with yellow adherent hairs

(f. *typica*), or yellow hairy coat in posterior half (ab. *lateapicalis* Plav.), or black round hairy spot in middle (ab. *deliquus* Plav.); sometimes base of elytra, including humeral tubercle, reddish-rust (ab. *laterufescens* Pic), or two anterior bands very narrow with yellowish tinge (ab. *sauteri* Schw.). Body length 18 to 25 mm.

Material: Described from collection of the Zoological Museum, Moscow State University. We did not find it.

Distribution: Northeast China, Korea Peninsula, Japan. It is possible that this species occurs in the southeastern parts of the Ussuri-Primor'e region.

Biology: Inhabits deciduous forests. Beetles fly in June and July, found up to September. Larvae develop in wood of *Molus bombycis* (Kojima and Okabe, 1960).

18. **Xylotrechus villioni** Vill.

Villard, 1892, *Bull. Soc. Entom. Fr.*, p. 51; Kojima and Okabe, 1960, *Food Plants of Jap. Cerambycidae*, p. 28; Kojima and Hayashi, 1969, *Insect Life in Japan*, Vol. 1, p. 75.

Adult (Figure 38): Differs well from other species of the genus in large dimensions and characteristic pattern on elytra. Head with dense compactly adherent hairs, markedly retracted into prothorax, but eyes far more removed from anterior margin. Genae long, broad, their length not less than maximum diameter of eye, with dense punctation. Frons with parallel sides, only slightly broadened anteriorly; front carina faint; deep median groove on frons merges posteriorly into vertex. Eyes small, convex, minutely faceted, reniform, deeply notched on inner upper side; notch entirely covered with dense adherent yellow hairs. Tenth antennal segment extends beyond posterior margin of pronotum, slightly thickened at apex; 4th segment shorter than 3rd, equal to 5th; 6th to 9th segments with barely produced outer angle; 10th segment broadens slightly
70 toward apex; 11th segment with small constriction in second half, apically pointed.

Pronotum transverse, rounded on sides, with narrow posterior constriction, and narrow, slightly turned posterior margin; narrows abruptly posteriorly, gradually anteriorly, and markedly convex in anterior part; with fine very dense punctation creating matte texture, short adherent yellowish or brownish hairs, uneven lateral depressions, and short longitudinal groove on posterior slope. Scutellum flat, triangular, narrowly rounded posteriorly, with fine punctation and adherent brownish hairs. Elytra narrow slightly from humeri toward apex, broadly rounded apically; disk convex, with rounded humeri, on inner side of which faint longitudinal depression occurs at base; covered with dense very fine diffuse punctation, adherent brownish or yellowish hairs, and trans-

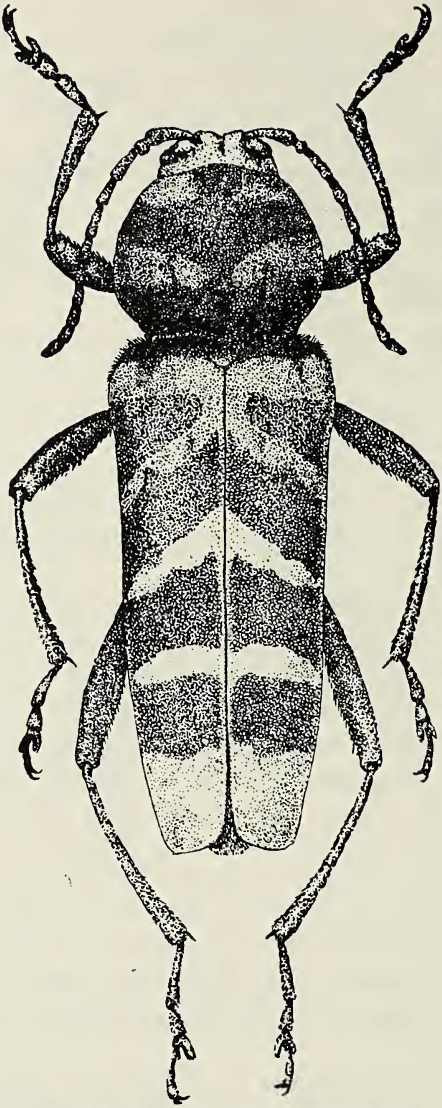


Figure 38. *Xylotrechus villioni* Vill.

verse light-colored bands. Legs very long, femora thick. Hind femora reach only up to posterior quarter of elytra. Hind tarsi 0.66 length of tibiae. First segment of hind tarsi distinctly longer than two successive segments together. Metasternum with dense fine punctation. Abdominal sternites with dense adherent yellowish hairy cover in posterior half (but sternites IV to V almost entirely). Sternite V broadly rounded posteriorly. Body black or blackish-brown. Antennae and legs rusty for most part. Elytra dark brown, with several crossbands: crossband at base (covering humeral turbercle on sides) and oblique stripe originating from suture toward sides posteriorly light rust; crossband before middle (extending forward along suture), more uniform crossband behind middle, and broad crossband at apex yellow; covered with dense compactly adherent yellowish hairy cover. Body length 22 to 27 mm.

Material: Collected in forest on Kunashir Island (northern bank of Lake Peschano). Only one adult insect.

Distribution: Kunashir, Islands of Japan. Belongs to group endemic to islands.

Biology: Inhabits forest plantation. Adult insects emerge in August. According to some reports (Kojima aad Okabe, 1960), ecologically associated with spruce (*Picea jezoensis*). However, the preimaginal phases of this species have not yet been studied.

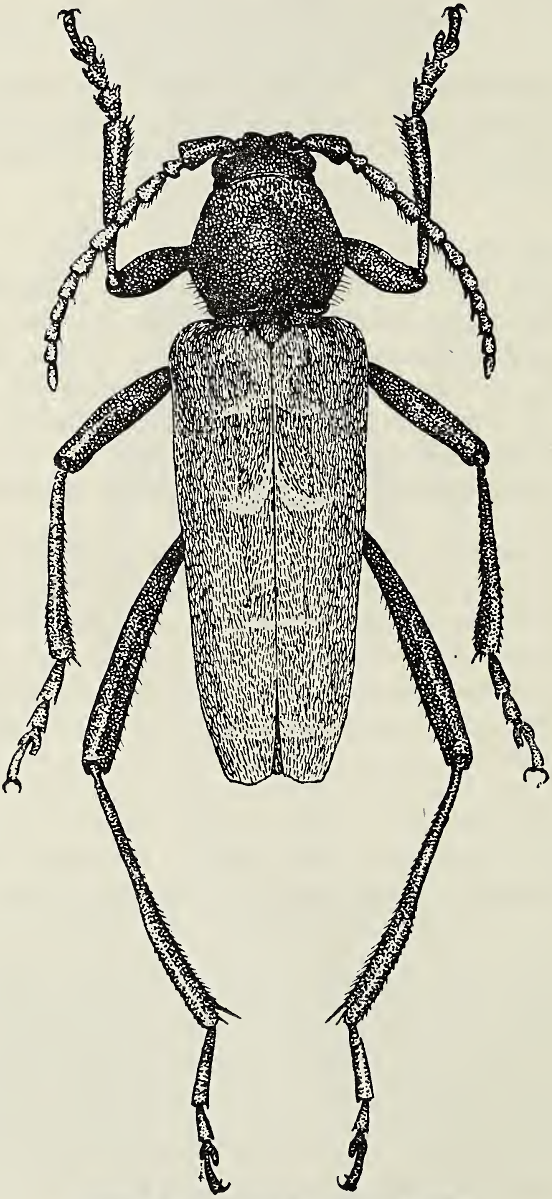
71 19. **Xylotrechus altaicus** (Gebl.)

Gebler, 1836, *Bull. Soc. Nat. Moscou*, vol. 9, p. 342 (*Clytus*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 343–345; Tal'man, 1940, *Trudy Lesotekhn. Akad. im. Kirova*, vol. 57, pp. 60–62; Tal'man, 1940, *Zhurn. Lesn. Khoz-va*, vol. 7, p. 61; Cherepanov, 1946, *Uchen. Zap. Novos. Gos. Ped. In-ta*, vol. 3, pp. 115–145; Cherepanov, 1948, *Entomol. Obozr.*, 30, 1–2, 132–137; Cherepanov, 1952, *Listvennichnyi drovosek*, pp. 1–104; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed., pp. 27–29.

Adult (Figure 39): Characterized by weak development of frontal carinae, very fine punctation of pronotum, and straw-yellow elytra. Head short, vertex and occiput with spines, dense punctation, and more or less developed median longitudinal groove. Frons with parallel sides (female) or broadens slightly anteriorly (male); sides with dense white hairs directed laterally, forming two longitudinal stripes; two faint median carinae with large puuctation. Genae broad, with dense punctation adherent gray hairs, and smooth glabrous produced anterior margin. Eyes minutely faceted, notched over less than half distance. Antennae short, extend beyond elytral base by 8th (male) or sometimes 10th (female) segment; 3rd segment notably longer than 4th; much shorter than 1st.

Pronotum not longer (male) or even shorter (female) than wide, rounded laterally, narrows rather abruptly posteriorly, gradually anteriorly, with fine dense granular punctation and very short gray hairs; side with numerous glabrous granulated dots, disk in female hemlspherical, convex, in male with median longitudinal carinate elevation; sides with longitudinal depression and two triangular notches slightly behind anterior margin with apices pointing backward, sparse large granular punctation, and denser gray hairy cover. Scutellum flat, broad, smoothly
72 rounded posteriorly and with minute adherent hairs.

Elytra moderately elongate, narrow more (male) or less (female) toward apex, truncate at apex (with angles produced) or obtuse (with rounded angles); disk convex, with more or less discernible longitudinal striation, very fine punctation, and dense short, gray, compactly adherent hairs. Ventral surface of body with long adherent hairs, forming whitish border on posterior margin of prosternum and on posterior



71 Figure 39. *Xylotrechus altaicus* (Gebl.).

margin of abdominal sternites I to IV. Legs long; hind femora reach (male) or slightly short of (female) elytral base, Head, pronotum, and entire lower surface of metathorax black; abdomen with rusty tinge. Antennae and legs rusty-red. Triangular notches near anterior margin of pronotum sometimes with rusty tinge in male. Sometimes entire lower surface of thorax and abdomen brownish-rust. Elytra brownish, with straw-yellow tinge, base rusty-red. Suture behind scutellum with short rusty stripes diverging laterally, disk with white hairy crossbands: one crossband short, extends along suture, and located before middle; second long, behind middle; and third before posterior slope.

Usually one anterior and two posterior elytral bands present (f. *typica*), rarely all three bands well developed (ab. *superfasciatus* Plav.). Hairs easily rubbed off and bands on elytra disappear. Body length 12 to 24 mm.

Egg: White, elongate, rounded at poles. Chorion smooth, without noticeable sculpture, transparent. Length up to 2.5 mm, width 0.8 mm.

Larva (Figure 40): Characterized by presence of large number of bristles on labial mentum, dense even hairy cover on lower side of prothorax, presence of glabrous sclerites on it, and other characters. Head markedly retracted into prothorax, with almost parallel sides, narrows only near antennae. Epistoma slightly convex, anterior margin near clypeus without perceptible notch, with distinct dark brown border, behind which three small hairy pores occur laterally; with well-developed median longitudinal suture, and laterally fused with parietals. Frontal sutures not visible. Hypostoma flat, with parallel sides, straight anterior outer angles, anterior margin with dark rust smooth border, without wrinkles. Gular plate short, not longer than width at base, with dark rust or dark brown tinge. Parietals dark rust in anterior third, darker at anterior margin; medially with dense rusty hairs forming crossband that extends from hypostomal sutures up to epistoma.

Antennae long, brownish from middle of 1st segment, extend significantly beyond anterior margin of cephalic capsule. Ocellus near antennal base very small, oval, 0.40 width of 1st antennal segment. Clypeus trapezoid, whitish, with brownish tinge. Labrum with broad basal constriction, broadly rounded anteriorly, rounded or even angularly broadened laterally; disk convex, glabrous in posterior half, with short dense bristles in anterior half. Mandibles black, on outer side uneven near base, and at several places convex, tubercular. Maxillary palps thin, comparatively short, barely protrude forward beyond apex of inner masticatory lobes of maxillae. Submentum of labium more rounded toward front, without scapular projection on angles; width not more than length, posterior half with four bristles forming transverse rows (in other species
73 of this genus submentum with only two bristles, located closer to middle).

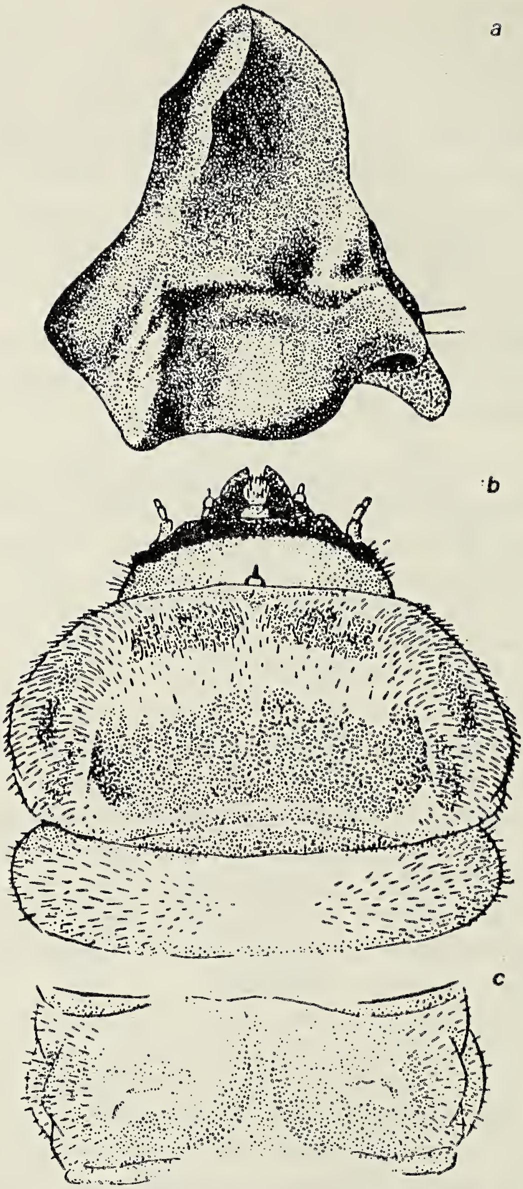


Figure 40. Larva of *Xylotrechus altaicus* (Gebl.). a—mandible; b—head and pronotum; c—abdominal tergite with dorsal locomotory ampulla.

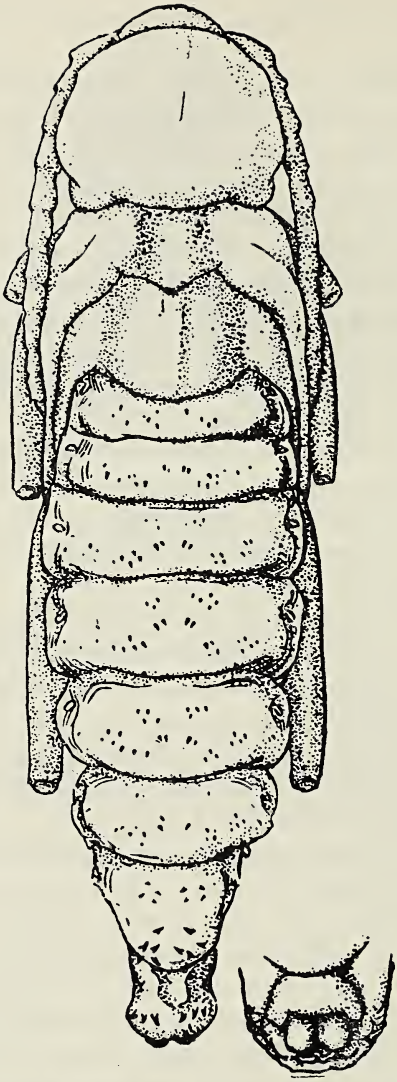
Mentum narrows toward base, in middle with coarse bristles forming crossband.

Pronotum transversely oval, narrows more anteriorly, slopes toward head, and elevated posteriorly (more convex); with pair of lustrous yellow spots in anterior third, narrow white notch on anterior margin; sides with longitudinally elongate, lustrous glabrous yellow spot; anterior half before scutellum with sparse rusty hairs that are denser in region of yellow spot, on sides dense and directed backward. Pronotal shield contrasting rust, sclerotized, with very fine dense spinules, rounded and insignificantly elongate at anterior margin, slopes gradually from here to sides, not produced forward at anterior angles, with narrow median
74 longitudinal groovelike stripe, and laterally bound by short outcurved longitudinal grooves. Alar lobes near lateral grooves convex and sclerotized. Prosternum with even dense rusty hairs on presternum; eusternum with pair of glabrous sclerites that extend forward up to middle or beyond it, divided by hairy clearance that is not broader than sclerites per se; sternellum covered with dense finely tubercular spinules forming brownish-rust crossband.

Abdomen laterally with dense short rusty hairs. Dorsal locomotory ampullae very convex, divided by common median longitudinal groove, sclerotized, and with fine brownish spinules; longitudinal folds on sides diverge anteriorly and white coriaceous spot occurs here. Ventral locomotory ampullae less convex, also sclerotized, with white spot on disk (along side of longitudinal groove). Body length of middle-aged larvae 25 to 30 mm, width of head 3.5 to 4.5 mm.

Pupa (Figure 41): Body comparatively large. Head with broad longitudinal depression between antennae on which transverse pattern occurs, distinctly depressed on vertex, with smooth, broadly rounded occiput, and region of clypeus and labrum with coarse transverse wrinkles. Antennae apically flexed at midfemora and barely extend beyond elytra.

Pronotum markedly convex, barely transverse (female) or its width not more than length (male), with narrow transverse groove near posterior margin, with denser bristles laterally, on disk and in anterior half with sparse stray acicular bristles, in posterior half glabrous on posterior slope, without bristles, and with small longitudinal depression near posterior angles, which diverge laterally. Mesonotum not longer than wide, with median longitudinal, transversely patterned stripe, posterior half saddle shaped, with deeper depression near posterior angles, and barely produced scutellum on posterior margin. Metanotum slightly convex, with median longitudinal channel-shaped groove, and barely projecting transverse striation. Apices of hind femora extend beyond abdominal segment V (male) or IV (female).



73 Figure 41. Pupa of *Xylotrechus altaicus* (Gebl.).

Abdomen moderately elongate, narrows weakly anteriorly, much more so (gradually) posteriorly. Abdominal tergites with narrow median longitudinal groove, with short acute spinules directed backward. Spinules on abdominal tergite I minute, barely perceptible. Tergites II to VI with longer spinules in posterior half forming one crossband on each side (eight to ten spinules in each band); paramedial spinules immediately posterior to middle, near longitudinal groove, paired and adjacent (two spinules on each side of median line); spinules in anterior half minute, form regular or steplike transverse row. Tergite VII more (female) or less (male) elongate, narrowly (female) or broadly (male) rounded at posterior margin, with four to eight large spinules near posterior end directed forward and forming transverse row; anterior to this row two incurved spinules occur; spinules in anterior half straight, errect or directed backward and toward middle, and form transversely elongate group or transverse row. Tergite VIII elongate, with parallel sides (female), or short and semicircular (male), with four to seven small, erect, acute, straight spinules on posterior margin. Valvifers of female large, contiguous, hemispherical, and apically with or without elongate tubercle. Body length 18 to 27 mm, width of abdomen 4.0 to 7.0 mm.

Material: Collected in Altai, Tuva, and Trans-Baikal region. Adults 734, larvae 104, and pupae 63 (males and females).

75 *Distribution*: From the Urals (Sverdlov) up to the Pacific coast, from Yakutia to Altai, Amur and Sakhalin; northern Mongolia. Found in large numbers in the foothills of Altai, Tuva, and southern Trans-Baikal regions.

Biology: Inhabits coniferous plantations of northern Asia. Ecologically associated with deciduous plantations; larvae monophagous and rise in mountains up to 1,500 m above msl. Beetles emerge from late June or early July to early August. Maximum number of beetles observed in middle and end of July, but sighted to end of first half of August. Beetles do not visit flowers, do not feed, and utilize adipose deposits accumulated during larval period; their requirement for water is satisfied by dew on plants. Life span of beetles one to two weeks, rarely three weeks. Under laboratory conditions males survived in cages for 10 to 16 days and females for 14 to 19 days. Only a few insects died 32 days after emergence from wood.

During the period of reproduction beetles are found in large numbers on trunks of viable larch. They are more active in clear warm weather from 2:00 to 4:00 p.m. at 20 to 28°C. Some mate, others oviposit, a few scuttle on trees or fly from one to the other, and so forth. With a reduction in temperature to 10°C, mating and oviposition cease; at the onset of subzero temperatures beetles become dormant. For example, in the Trans-Baikal region when the temperature at 7:00 a.m. on August 3rd was −0.3°C, beetles were dormant; by 12:00 noon when the temperature had risen to 17°C, beetles began to crawl and resume oviposition. One female can lay up to 145 eggs in her lifetime.

Oviposition commences 10 to 13 hrs after the first mating. Males do not leave females, however, but continue to mate with them intermittently. Females lay eggs singly and at some distance from one another in bark crevices. Oviposition is intensive in the first five to six days of adult life, decreases thereafter, and ceases 13 to 15 days later. For example, in one experiment 20 females in cages laid 1,154 (76.7%) eggs within the first five days of life, 302 (20.1%) in the next five days, and 48 (3.2%) subsequently. In another experiment four females laid 185 (97.9%) eggs within the first five days of life, three (1.6%) in the next five days, and one (0.5%) subsequently. Infestation first occurs in overripe trees, predominantly thick and physiologically susceptible, followed by thin, healthy, and less susceptible trees. Tree trunks are occupied throughout their length, commencing from the root collar. We examined 57 trees in which the trunks were infested over a length of 2.0 to 14.4 m. Eggs are laid on the southern side of the trunk. For example, from 33 sections cut from the lower, middle and upper zones of 11 trees infested with long-horned beetles, 5,855 eggs were collected, of which 98% had been lain on the southern side and 2.0% on the northern; the latter were located in the border zone of the southern half of the trunk.

Beetles are photophilous; during reproduction they prefer the illuminated side of the trunk and usually avoid the shaded part. If the lower zone of the trunk is shaded by undergrowth, no beetles are found there. During the period of mass reproduction in the Trans-Baikal region, according to our estimate up to 4,500 eggs (average about 3,150) are laid on a single trunk over a length of 9.0 m (diameter at chest height 21 cm), and each dm² of infested surface area contained about 13 eggs. Newly fallen trees (windfalls, cut logs), slight larch trees, and viable trees of other species are not occupied by beetles. This species completes development under natural conditions only on viable larch trees.

76 Under natural conditions the duration of egg development is about two weeks. Fully formed larvae are visible through the eggshell after eight to ten days. We kept 651 eggs under observation in the laboratory. At 19.2°C the first larvae appeared in 12 days and the last larvae in 16 days, i.e., on the average egg development continued for 13.4 days. Some eggs died prematurely. For example, from August 7 to 20 we collected 5,306 eggs from 10 trees, of which 209 were dead. Larvae hatched from the remaining eggs. Hatching commenced at the end of the third week of July and was completed by mid-August; mass emergence took place at the end of July to the beginning of August.

A fully formed larva ruptures the eggshell, emerges, and bores into bark. Sometimes it starts to bore bark before emerging completely from the chorion, in which case the latter is filled with fine bark frass. Subsequently the larva either reaches the bast, makes a small depression in it, or sometimes moves again into the cork layer filling the gallery behind with frass. If the larva cannot move into the cork layer from the damaged bast, then the gallery fills with oleoresin oozing from the wounded bast and the larva dies. The activity of young larvae results in numerous damaged points or pricks in the bast, leading to its total desiccation (Cherepanov, 1946, 1952).[1]

In mid-September we cut 10 pieces of wood (half-meter lengths) from four trees infested with young larvae. The bark of these pieces contained 1,404 live larvae and the bast 11,279 damage points (pricks). In an area of 1.0 dm^2 bast surface up to 78 such pricks were counted. Oleoresin oozes from the wounds made in the bast along bark slits on the surface of the trunk, resulting in the so-called resin flow that shines in the sun. Resin flows appear after mid-August and the extent of larval infestation of trees can be estimated on the basis of their occurrence. Young larvae remain in and under the bark for the winter season. The body length of a larva varies by this time from 3.0 to 4.5 mm (in bark) to 5.0 to 8.0 mm (under bark).

After the first hibernation larvae damage the bark on the southern side of the trunk, where they excavate galleries perpendicular to the trunk, which leave a deep impression on the wood. Some larvae move from the southern side to the eastern side of the tree and an almost equal number to the western side. On examination we found 2,617 larvae on 24 trees, of which 1,236 had moved from the southern side of the trunk to the eastern side, and 1,171 to the western side, with only 210 remaining on the southern side. Similar observations were recorded on many other occasions. In making transverse galleries under the bark the larvae damage the bast and, if they move around the entire circumference of the trunk, the tree dies. When the larvae cannot complete the circle around the trunk, the tree continues to grow with the help of callus growth on the opposite (usually northern) side. Such trees may live up to 70 years or more. The gallery under bark impressed on alburnum reaches 30 to 35 cm in length and 10 to 13 mm in width.

From mid-July middle-aged larvae begin to penetrate deeper into the wood. During this process they turn abruptly toward the sides of the damaged bast and continue to excavate galleries transverse to the trunk axis. Possibly the moisture of the wood helps in orientation. According to our estimates the moisture content of the wood adjoining 77 healthy bast is 58%, and that adjoining bast damaged by larvae only 28%. In other words, larvae make their galleries in the wood in the direction of minimum moisture content. They remain in the wood at a depth of 1.0 to 10.0 cm during the second winter, with the largest number (89%) found up to a depth of 5.0 cm. After the second hibernation the larvae continue to make galleries in the bark after a rise in temperature, then form a pupal cell at the end of the gallery across the trunk, usually perpendicular to its surface. The pupal cell is supported in the

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[1] The behavior of young larvae of *Xylotrechus altaicus* (Gebl.) had been discovered much earlier than is reported in some publications (Rozhkov, 1970, 1971; Mamaev and Danilevskii, 1979).

bark; sometimes a small layer of wood remains between the bark and the pupal cell which is 1.0 to 3.0 mm thick, rarely up to 9.0 mm. The larva pupates with its head toward the bark. Length of gallery in wood 20 to 30 cm or more, width 7.0 to 14.0 mm. Length of pupal cell 28 to 34 mm, width 9.0 to 12.0 mm.

Pupation commences at the beginning of June and terminates in early July. According to our observations recorded in the forests of Trans-Baikal, of every 100 larvae, 16 had pupated by June 10, 35—June 11 to 20, 42—June 21 to 25, and seven—in the remaining period of pupation. In 1970 of the 566 larvae examined in Tuva, 248 (43%) had pupated by June 7. Under laboratory conditions at 22°C pupae developed in 14 days, while in the forest at 14 to 19°C development continued for 16 to 20 days.

The emergence of beetles from pupae begins at the end of June and terminates by July 10 to 20. For example, in Trans-Baikal in 1940 the pattern of emergence of every 100 beetles was as follows: 39—June 25 to 30, 48—July 1 to 5, and 13—July 6 to 12. Fully developed beetles remain in the pupal cells for eight to ten days and thereafter cut round openings (4.0 to 7.0 mm in diameter) on the bark surface and emerge. The emergence of beetles commences at the end of June or in early July and terminates at the end of the third week of this month. For example, in 1940 in the forests of Trans-Baikal 1.0% beetles had emerged from wood by July 1, 85% from July 1 to 13, and 14% in the remaining period. In 1948 in the forests of Tuva at a height of 1,500 m above msl, 17% beetles emerged from wood by July 15, 52% from July 16 to 20, and 31% in the remaining period. Mass emergence terminates by July 25. Beetles from the southern side of the trunk emerge one to two days earlier and in a much shorter interval of time than those from the northern side. However, a few individuals are delayed in development and emerge from wood at the end of July or even in August.

During the period of metamorphosis the weight of individuals decreases by almost 33%. For example, the weight of 23 larvae before pupation was 8,428 mg (average 366.4 ± 20.3), of pupae developed from them 7,754.5 mg (337.1 ± 19.5), and of beetles developed from these pupae before emergence from wood 5,839.0 mg (average 253.9 ± 16.5). Based on weight records of 69 individuals, larvae before pupation weighed 148 to 662 mg (average 369.9 ± 12.0), pupae 133 to 630 mg (341.5 ± 10.2) and young beetles 129 to 504 mg (261.9 ± 8.9). Cycle of development completed in two years (Table 2).

Part of the population dies in the egg stage, I-instar larvae die from mite infestation (*Pediculoides ventricosus* Newp.), and older larvae from chalcid flies (*Xylonomus sepulcralis* Holmyr., *Xorides nitens* Grav., *X. collaris* Grav.) and *Billaea*.

Table 2. Periods of Development of *Xylotrechus altaicus* (Gebl.)

Year of development	May	June	July	August	September	October
1st	L	LPA	LPAE	AEL	L	L
2nd	L	L	L	L	L	L
3rd	L	LPA	LPAE	AEL	L	L

The biology of *Billaea* is of great interest. The larvae live in the body cavity of the host and, on completion of the parasite's development, 78 behavioral changes are seen in the host—the long-horned beetle larva exits from the wood and dies. The parasite damages the internal tissues of the host, finds its way into the frass with which the gallery is packed, and pupates. The adult fly exits from the wood through the opening made by the host larva (Cherepanov, 1948).

According to observations recorded in Trans-Baikal from 1939 to 1940, egg mortality (during mass reproduction) is about 4.0%, larval mortality in and under bark 88.0%, and mortality of mature larvae and pupae in wood about 3.2%. The overall survival rate of the population throughout its entire life cycle is only 4.8%. Such an obviously low survival rate suggests progressive resistance to this species. The significant mortality rate of larvae in and under bark is explained by the greater resistance of the wood, which releases abundant oleoresin from wounds made in the bast.

Xylotrechus altaicus (Gebl.) belongs to the group of serious pests of deciduous plantations. Tree damaged by the larvae die, and viable wood loses its marketable qualities. We examined 40 damaged trees with a trunk diameter of 20 to 34 cm at chest height. Commencing from the root collar, over a length of 7.6 m larvae had made an average of 275 galleries, in some trees as many as 642 galleries. The average number of larval galleries that had penetrated the wood was 36 to 37 for each meter length of the trunk. In addition to this species, wood is also damaged by *Monochamus urossovi* Fisch., *M. sutor* (L.), *M. impluviatus* Motsch., *Tetropium gracilicorne* Reitt., *Rhagium inquisitor* (L.), and other species which hastens tree mortality.

2. Genus *Clytus* Laich.

Laicharting, 1784, *Verz. und Beschr. der Tyr. Ins.*, vol. 2, p. 88; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 391–392; Linsley, 1964, *Cerambycidae of North America*, 22, 5, 164.

Adult: Differs from adult insects of the *Xylotrechus* in absense of frontal carinae. Frons flat, without carinae, and with deep punctation. Eyes with minute facets, deep and comparatively broad notch. Antennae often thicken slightly toward apex, short, barely extend beyond 0.33 length of elytra (male) or even do not reach their posterior margin (female). Pronotum laterally rounded, transverse or slightly oblong, with markedly convex disk; in male usually with dense double punctation (spaces between large punctures covered with minute dense punctation), and matte for most part; in female with simple large punctation (spaces between punctures smooth, not narrower or even broader than punctures) and not matte. Elytra elongate, usually with parallel sides, apically rounded (*C. fulvohirsutus* Pic), or truncate with produced outer angle (*C. raddensis* Pic), or broadly truncate with markedly produced, spine-like (outer and inner) angles (*C. melaenus* Bat.), with very dense (*C. raddensis* Pic) or sparse (*C. melaenus* Bat.) punctation, and transverse hairy bands. Hind femora short, do not reach or barely reach elytral apex (*C. arietoides* Reitt.), or very long and extend in both male and female far beyond elytral apex [*C. melaenus* Bat., *C. arietis* (L.)].

Larva: Characterized by median suture of epistoma reduced to barely noticeable line at apex and frontal sutures not visible. Parietals fuse into common complex with epistoma. Ocellus near antennal base small, convex, rounded or oval, sometimes indistinct or not visible (*C. fulvo-*
79 *hirsutus* Pic). Pronotum in anterior third with two transverse rectangular yellowish-rust spots separated by whitish clearance, and without notch on anterior margin. Pronotal shield with longitudinal streaks, base with fine sculpture, anterior margin bidentate, markedly produced medially and at anterior angles (*C. raddensis* Pic), or not produced (*C. melaenus* Bat.). Thoracic legs lacking, only in some specimens evident before pupation in form of barely perceptible tubercles. Locomotory ampullae well developed on abdominal segments I to VII, moderately convex, with fine sculpture.

Pupa: Characterized by flat or groovelike impressed frons and short antennae with apices adjoining elytra. Pronotum convex, with or without narrow basal constriction, in anterior half and laterally usually with large spinules bent toward middle (*C. raddensis* Pic, *C. melaenus* Bat.) or erect and straight spinules (*C. fulvohirsutus* Pic). Abdominal tergites with spinules forming transverse jumbled row or transverse line (*C. raddensis* Pic), or medial ones angularly bent forward and stripe of lateral ones backward (*C. melaenus* Bat.).

Eight species of the genus *Clytus* Laich. are known in northern Asia. One [*C. arietis* (L.)] is distributed in Europe up to the Urals, one (*C. arietoides* Reitt.) from the Urals to the Pacific coast, and the others confined to the eastern part of Asia. *Clytus rahmni* Germ. has been reported for the southern Urals (Romadina, 1958). However, the larvae used in the identification of this species actually belong to *Chlorophorus varius* (Müll.).

Clytus raddensis Pic, *C. fulvohirsutus* Pic, and *C. arietis* (L.) are trophically associated in the larval stage with many deciduous trees, and *C. arietoides* Reitt. with conifers. *Clytus melaenus* Bat. develops on oak and essentially belongs to the monophagous group. Among the species of this genus the following are particularly numerous within the area of their distribution: *C. arietoides* Reitt., *C. raddensis* Pic, and *C. fulvohirsutus* Pic. The most common species is *C. melaenus* Bat. The remaining species are very rare and some (*C. hypocrita* Plav.) known only on the basis of isolated type specimens.

The genus *Clytus* Laich. is Holarctic in origin, distributed in Eurasia and North America, with about 35 species known in the fauna of the former and only six in the latter. The more common species of the genus *Clytus* are presently absent in these continents.

Type species: *Leptura arietis* Linnaeus, 1758.

KEY TO SPECIES

Adult Insects

1 (8). Anterior hairy bands on elytra turn slightly forward at inner end, barely reach anterior margin of middle third of elytra; posterior bands strictly transverse, narrow, do not broaden at inner end.

2 (5). Hind femora do not reach elytral apex.

3 (4). Pronotum with yellowish hairy border along anterior margin; elytra with short basal crossband. Northern Asia, Ural. . . . . 1. **C. arietoides** Reitt.

4 (3). Pronotum without yellowish hairy border along anterior margin; elytra without short basal crossband. Eastern region of Asia. . . . . 2. **C. nigritulus** Kr.

5 (2). Hind femora extend beyond elytral apex.

6 (7). Pronotum without hairy border along posterior margin. . . . . 3. **C. venustulus** Plav.

80 7 (6). Pronotum with broad hairy border along posterior and anterior margins. Elytra with very dense, fine diffuse punctation; space between punctures smaller than punctures. Europe. . . . . 4. **C. arietis** (L.).

8 (1). Anterior hairy bands on elytra markedly curve forward at inner end, reach first quarter of elytra along suture; posterior bands turn slightly forward near suture and broaden notably at inner end.

9 (10). Elytra with well-expressed hairy crossband behind base, with sparse smooth punctation; distance between punctures several

times greater than punctures. Kunashir Island. . . . .
. . . . 5. **C. melaenus** Bat.

10 (9). Elytra without hairy crossband behind base, sometimes only with small white hairy spot, with very dense rugulose punctation; distance between punctures not greater than punctures.

11 (12). Elytra obliquely truncate at apex, with produced, spine like inner angle. Eastern region of Asia. . . . . . 6. **C. raddensis** Pic.

12 (11). Elytra rounded or slightly pointed at apex, not produced at inner angle.

13 (14). Head, pronotum, and elytral base with short light-colored and erect hairs. Elytra with white spot behind base and broadly rounded apically. Ussuri-Primor'e region. . . . .
. . . . , . . . 7. **C. hypocrita** Plav.

14 (13). Head, pronotum, and elytral base with very long erect brownish hairs. Elytra without white spot behind base, obliquely pointed at apex. Eastern regions of Asia. . . . .
. . . . 8. **C. fulvohirsutus** Pic

Larvae

1 (4). Hypostoma with broad dark brown and conspicuously convex border an anterior margin, with shagreen or linearly shaded sculpture.

2 (3). Hypostoma on anterior margin with shagreen sculpture, without longitudinal streaks. Found on coniferous trees. . . . .
. . . . 1. **C. arietoides** Reitt.

3 (2). Hypostoma on anterior margin with thin dense longitudinal striation, with or without black dashlike transverse wrinkles. .
. . . . 4. **C. arietis** (L.)

4 (1). Hypostoma on anterior margin with light brown depression, without shagreen sculpture and without longitudinal striation, and with or without dashlike transverse wrinkles.

5 (6). Hypostoma with smooth anterior margin, not rugose. Pronotal shield with straight anterior margin, transversely truncate. Found on oak. . . . . 5. **C. melaenus** Bat.

6 (5). Hypostoma with rugose anterior margin. Pronotal shield with bidentate anterior margin, markedly produced medially and at anterior angles; if neither notched not transversely truncate, then with median transverse brownish stripe.

7 (8). Pronotal shield lustrous, with distinctly bidentate anterior margin. Found on deciduous trees. . . . . 6. **C. raddensis** Pic

8 (7). Pronotal shield more matte, with straight anterior margin, and sometimes with median transverse brownish stripe. Found on deciduous trees. . . . . 8. **C. fulvohirsutus** Pic

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Pupae

1 (4). Spinules on posterior margin of tergites IV to VI form distinct straight transverse row. Pupae found from July to April–May, hibernate.

2 (3). Pronotum with scattered long sharp and bent spinules in anterior half and on sides, and covered with thin piliform bristles. . . . . 1. **C. arietoides** Reitt.

3 (2). Pronotum with stray short, barely perceptible spinules in anterior half and on sides, with numerous long acicular bristles. . . . . 4. **C. arietis** (L.).

4 (1). Spinules on posterior margin of abdominal tergites IV to VI do not form distinct straight transverse row, but a jumbled one. Pupae found in May and June, do not hibernate.

5 (8). Spinules on pronotum large, slightly bent at apex.

6 (7). Head without acicular bristles on facial side. Spinules on sides of pronotum with barely produced or often without produced leathery base. . . . . , ... 5. **C. melaenus** Bat.

7 (6). Head with acicular bristles on facial side. Spinules on sides of pronotum with strong, often coarse, produced leathery base. . . . . 6. **C. raddensis** Pic

8 (5). Spinules on pronotum small, straight, not bent at apex. . . . . 8. **C. fulvohirsutus** Pic

1. **Clytus arietoides** Reitt.

Reitter, 1899, *Deutsch. Entom. Z.*, p. 281; Pavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 407–410; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed., pp. 44–45.

Adult (Figure 42): Distinguished from other species of this genus by rusty coloration of legs and antennae, and presence of distinct, oblique, dense hairy stripe behind elytral base on inner side of humeral tubercle. Head with light-colored, sometimes yellowish hairs. Frons broad, with moderately dense punctation that is denser on sides, and smooth median longitudinal stripe. Vertex slightly compressed, with dense punctation. Antennae apically thickened; 7th segment extends beyond base of pronotum; 3rd segment longer than 4th, equal to 1st.

Pronotum convex, its length slightly more (male) or not more (female) than width, laterally rounded, narrows almost equally anteriorly and posteriorly; disk hemispherical, convex, with fine very dense punctation, erect light-brownish hairs, and pale yellowish hairy border on anterior margin; yellowish hairs near posterior angles, sometimes forming narrow border here. Scutellum short, almost semicircular, with dense yellowish, compactly adherent hairs. Elytra with parallel sides, broadly rounded apically, often pointed with rounded angles, disk uniformly convex, with fine, highly compact punctation (punctation notably larger in anterior third), semiadherent brownish hairs and transverse dense light yellow hairy bands. Hind femora barely reach (male) or distinctly short of elytral apex (female). Body black or with brownish tinge. Antennae reddish-rust or rusty, often with darkened apex. Legs reddish-rust (f. *typica*), sometimes femora darkened (ab. *femorellus* Plav.). Elytra black or blackish-brown, immediately behind base with short yellowish crossband obliquely toward humeral tubercle, before middle with transverse band

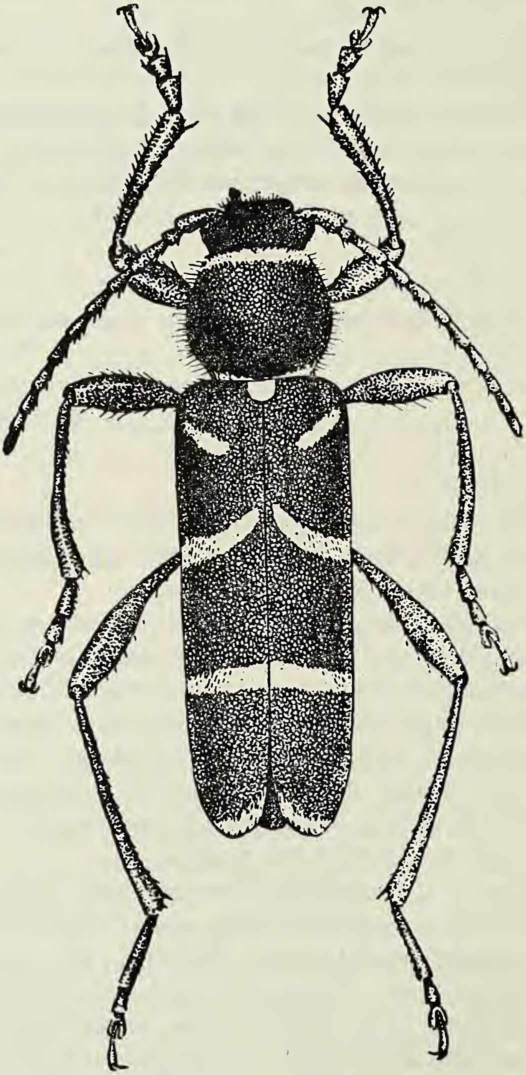


Figure 42. *Clytus arietoides* Reitt.

82 extending from lateral margin toward suture and slightly forward, with straight crossband at beginning of posterior third, and yellowish hairy border at apex. Body ventrally with light brownish semiadherent or erect hairs. Meso- and metasterna and abdominal sternites on posterior margin (especially along sides) with dense broad yellow hairy border. Body length 8.0 to 14.0 mm.

Egg: White, elongate; broadly rounded or slightly obtuse at anterior pole, narrower and pointed at the other. Chorion smooth, hyaline, transparent. Length 1.5 mm, width 0.6 mm.

Larva (Figure 43): Differs from larvae of other species of this genus in broad brownish border on anterior margin of hypostoma, and denser rusty hairy cover on prothorax and sides of abdomen. Head narrows slightly toward front, half of it retracted into prothorax. Epistoma smooth, lustrous, slightly compressed at apex and here with short median longitudinal brownish suture; fuses laterally with parietals, with smooth broad brownish border on anterior margin, behind which stray setaceous hairs form transverse row. Frontal suture not visible. Hypostoma divided into two separated sclerites, distinctly narrows anteriorly, with broad brownish shagreen sculptured border on anterior margin. Parietals apically with rusty-brown border that covers ocellus and antennal socket, and with sparse setaceous rusty hairs. Antennae comparatively long and slender, extend far beyond anterior margin of cephalic capsule; 3rd segment longer than 2nd. Ocellus near antennal base very small, length equal to 0.50 width of lst antennal segment, usually with brownish tinge. Clypeus trapezoid, hyaline. Labrum very convex, appears thick, transversely oval, and covered with dense rusty bristles in anterior half. Mandibles convex on outer side, with transverse groove near base, median longitudinal groovelike depression, broadly rounded apically, and hollow inside. Inner masticatory lobes of maxillae digitate, short, brownish, apically light colored, hyaline, and with short bristles at apex. Maxillary palps extend markedly beyond apex of inner lobes.
83 Mentum of labium transverse, laterally rounded, with bristles in middle forming crossband.

Pronotum narrows anteriorly from posterior end, with dense rusty hairs laterally and in anterior half before shield; anterior third with two transversely elongate, rectangular rusty spots, separated by narrow longitudinal clearance; laterally with longitudinally elongate glabrous yellow spot. Pronotal shield convex, bound laterally by longitudinal and barely curved grooves, with two moderate emarginations on anterior margin, coarse longitudinal wrinkles, and pair of short posteromedial wrinkles. Prosternum laterally with long hairs slightly bent backward; presternum with dense shorter erect rusty hairs; eusternum with two round glabrous lustrous sclerites, divided only in anterior half by hairy triangu-

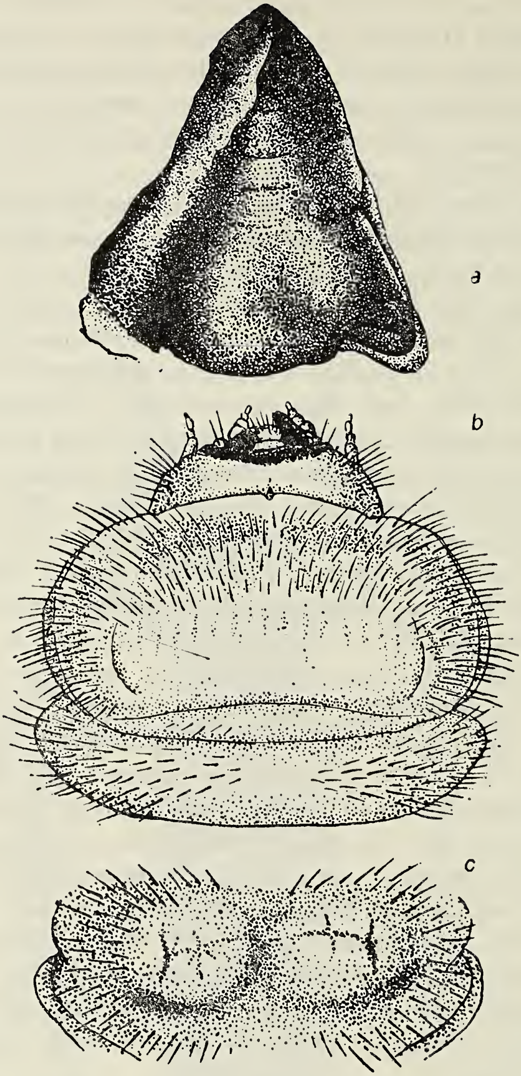


Figure 43. Larva of *Clytus arietoides* Reitt.
a—upper right mandible; b—head and pronotum; c—abdominal tergite with dorsal locomotory ampulla.

lar field that narrows posteriorly. Thoracic legs lacking, present only in some specimens as barely perceptible tubercles before pupation.

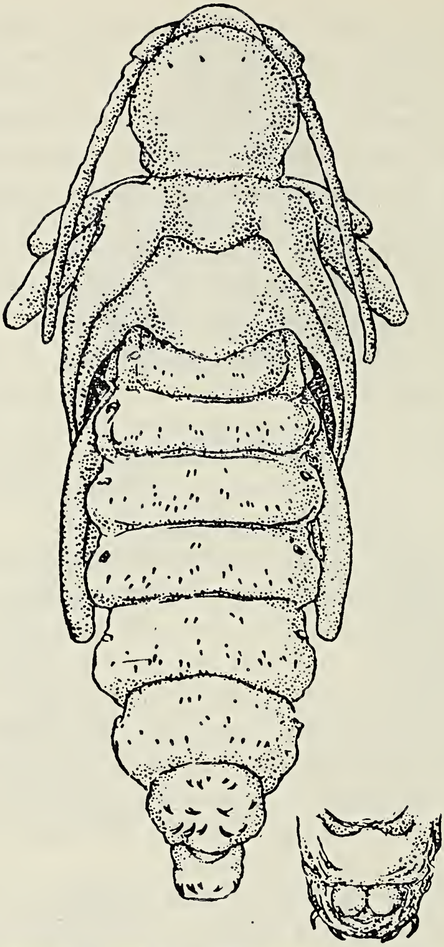
84 Abdomen narrows slightly posteriorly, sides with dense rusty hairs. Abdominal tergites usually with numerous hairs before, and several behind locomotory ampullae. Sternite IX with eight to ten setaceous hairs on posterior margin forming distinct transverse row, with two small hairs

anterolateral to row on each side forming another transverse row. Dorsal locomotory ampullae convex, leathery, with fine sculpture, narrow common median longitudinal groove, and short curved lateral grooves; disk with alveolar, sometimes radial depressions or longitudinally elongate folds. Ventral locomotory ampullae with common median longitudinal groove; disk with barely perceptible transverse groove, with short wrinkles originating from it that are sometimes barely visible; sides with alveolar shaped longitudinally elongate folds, of which posterior ones shifted laterally, anterior ones shifted slightly inward in form of projections. Body length 16 to 20 mm, width of head up to 2.5 mm.

Pupa (Figure 44): Characterized by presence of aristate spinules scattered along periphery of pronotum and other characters. Head flat between antennae, transversely rugose ahead of them, uniformly rounded on occiput, before clypeus, between lower (anterior) lobes of eyes, with short barely perceptible wrinkles forming transverse row. Antennae flexed to sides, with apices adjoining elytra.

Pronotum uniformly convex, laterally rounded, broadens medially, more in female, less in male, narrows uniformly anteriorly and posteriorly, and with narrow constriction near posterior margin; scattered aristate spinules in anterior half and laterally (large spinules along periphery) and stray acicular bristles; disk glabrous, lustrous in posterior half. Mesonotum slightly convex, length not more than width, and posterior margin with insignificantly produced, broadly rounded scutellum. Metanotum broadly rounded posteriorly, with median longitudinal groove, laterally with one or group of very fine scattered incurved bristles, visible only under high magnification.

Abdomen broadens slightly (female) or almost with parallel sides (male) in region of segments III to V, narrows smoothly or abruptly posteriorly. Abdominal tergites convex in posterior half, with narrow common median longitudinal groove; large sharp spinules close to posterior margin directed backward form transverse stripe that turns medially and laterally toward front; smaller spinules in anterior half located along sides of longitudinal groove form transverse row or short transverse stripe. Spinules on posterior margin of abdominal tergites IV to VI usually form distinct transverse row. Tergite VII narrows posteriorly and narrowly rounded here, with four to six large spinules on posterior margin bent forward forming transverse row, and pair of similar large spinules ahead of this row, behind middle of disk, bent inward; six to ten spinules (much smallar in size) in anterior half bent inward and backward. Tergite VIII transverse, broadly rounded posteriorly; posterior margin with four to six spinules bent inward and slightly forward (these spinules well developed in some, in others barely perceptible). Valvifers of female hemispherical, with laterally produced tubercle at



83 Figure 44. Pupa of *Clytus arietoides* Reitt., female.

apex. Body length 14 to 16 mm, width of abdomen 4.0 to 5.0 mm.

85 *Material*: Collected in Altai, middle Ob' region, Tuva, Yenisey taiga, and Yakutia. Adult insects 655, larvae 304, pupae 29 (males and females). Series of larvae obtained from eggs laid by beetles in the laboratory.

Distribution: From the Urals to the Pacific coast, north up to boundary of coniferous forest, south up to Altai, northern Mongolia, northern China, Korean Peninsula, Sakhalin Island, and Japan. Found in maximum numbers in southern Siberia.

Biology: Found in coniferous forests. Ecologically associated with larch, spruce, and other trees, rising in mountains up to 2,300 m above msl, i.e., up to upper limit of distribution in forests. Emergence of beetles greatly prolonged compared to other species, beginning end of May and terminating mid-August. Mass emergence observed in June and July, predominantly from mid-June to mid-July. For example, in various regions of Siberia 426 beetles were caught in nature: 3.3% end of May, 39.9% in June, 56.3% in July, and 0.5% in August. Beetles are most active in warm clear weather, visit flowers, but during reproduction remain more on trees inhabited by them, very mobile, moving rapidly over bark, and flying quickly from place to place. Mating takes place on trees and female lays eggs singly, spacing them in bark crevices. Oviposition occurs on trunks and twigs of drying but still standing, freshly felled, wind-snapped and felled trees of larch, fir, spruce, and other conifers. One female can lay up to 30 eggs in her lifetime, possibly more. Ovaries of one female collected from flower contained 28 mature eggs. Weight of single egg 0.16 mg. We kept 85 eggs under observation in the laboratory. Data established that at 14.6 to 19.6°C (average 17.0°C) larvae hatch in 16 to 20 days (average 17.4 days) after oviposition.

Larvae bore bark, make longitudinal meandering, sometimes fused galleries under bark, resulting in platformlike widenings which are compactly filled with fine frass. Galleries under bark deeply impressed in alburnum, with smooth or abruptly projecting margins. Length of gallery leaving impression under bark on alburnum up to 16.5 cm or more, width initially 1.5 to 2.0 mm, terminally 4.5 to 10.0 mm. First hibernation of larvae occurs under bark. For the second hibernation they bore into wood, make longitudinal galleries 4.0 to 8.5 cm long in upper layer at a depth up to 0.5 cm, which turn abruptly at end toward bark; width of gallery 4.5 to 6.0 mm. Diameter of entrance into wood from 3.0 mm × 4.0 mm to 5.0 mm × 6.0 mm. After making gallery up to bark, larva makes pupal cell that is transverse or oblique to trunk axis, fills exit with frass, and pupates. Length of pupal cell 15 to 18 mm, width 5.0 to 6.0 mm

Pupation of larvae observed in August. Pupae overwinter in cells and beetles emerge in spring. Hence in nature we found pupae only in spring and end of summer. For example, from pupae formed at the beginning of August, beetles were obtained in the laboratory only in mid-March. In another experiment a pupa was refrigerated at about 0°C on November 28. On April 16 of the following year this pupa was transferred to room temperature (19 to 22°C). The beetles emerged from it on May 4. Pupa enter diapause toward autumn. They very rarely survive when removed from the pupal cell and generally die.

Emergence of beetles begins in May and terminates beginning of July. Emergence from wood commences from end of May and continues up to June. Maximum number of beetles leaves wood toward July. Beetles emerge from wood with undeveloped gonads. For example, in a female dissected soon after emergence from wood, ovarioles were

86 distinctly visible, but eggs had not formed in them. Hence beetles visit flowers for supplementary feeding. Generation completed in two years (Table 3). Based on records for 45 specimens during metamorphosis, weight of larvae before pupation 40 to 191 mg, pupae 36 to 162 mg, and young beetles before emergence from wood 30 to 128 mg.

Table 3. Periods of development of *Clytus arietoides* Reitt.

Year of development	April	May	June	July	August	September
1st	P	PA	PAE	AEL	AEL	L
2nd	L	L	L	LP	LP	P
3rd	P	PA	PAE	AEL	AEL	L

Note: Pupation of larvae begins end of July, with first pupa formed by July 29. Number of pupae maximum in August.

Clytus arietoides Reitt. often lives in felled trees in forests, wood shavings, and trees weakened by the Siberian moth (*Dendrolimus sibiricus*) and other primary pests. We obtained 101 beetles from larvae collected from choke-wood, comprising 42 from larch, 20 spruce, 20 fir, 18 pine, and one cedar. During an inspection of forests 277 individuals were additionally extracted from wood at the larval, pupal, and adult stages: 43.8% from fir, 26.1% pine, 16.7% larch, 13.1% spruce, and 0.3% cedar. This species was not found on deciduous trees. *Rhagium inquisitor* (L.), *Tetropium gracilicorne* Reitt. (on larch), and *T. castaneum* (L.) (on spruce and fir) were often found together with this species.

2. **Clytus nigritulus** Kr.

Kraatz, 1879, *Deutsch. Entom. Z.*, vol. 23, p. 109; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 411–412.

Adult (Figure 45): Differs from other species of this genus in absence on elytra of light-colored hairy stripe at base as well as dense hairy border at apex. Frons slightly convex, with dense punctation, long erect hairs, and faint median longitudinal groove. Vertex flat, with large dense punctation, and short erect hairs. Antennae thicken slightly toward apex; 7th segment extends beyond elytral base. Pronotum roundly con-
87 vex on disk, with dense fine punctation that imparts matte velvety texture, and with thin erect brownish hairs. Scutellum slightly longitudinal, flat, broadly rounded posteriorly, with dense adherent yellow hairs in posterior half. Elytra parallel, slightly obtuse at apex, with broadly rounded angles, dense notchlike hairy punctation (with sharp semiadherent brownish-black hairs, one hair in each notchlike spot), two dense yellowish hairy crossbands, of which anterior band (oblique) before middle,

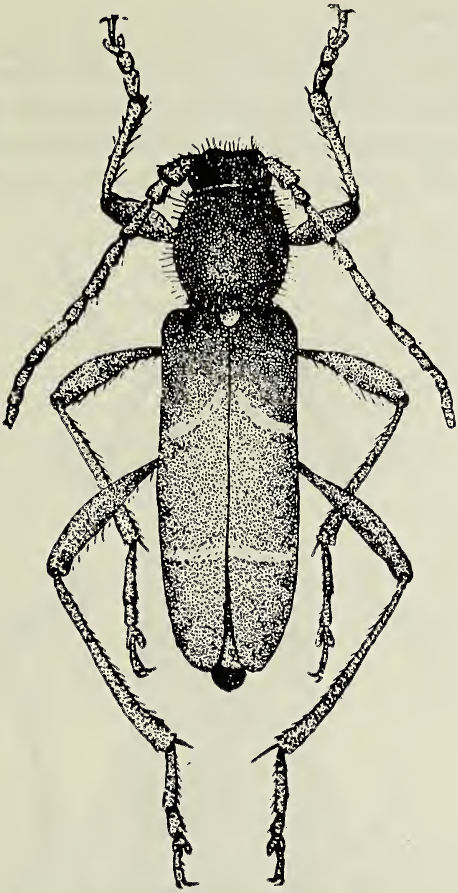


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Figure 45. *Clytus nigritulus* Kr.

posterior (straight) in beginning of posterior third of elytra, and stray yellowish hairs at apex that do not form yellow border, or without them. Body ventrally with sparse brownish hairs. Abdomen lustrous, posterior margin of sternites with sparse yellow hairy border laterally. Episterna of meso- and metathorax with yellowish hairs forming one yellowish spot on each. Hind legs comparatively long; tibiae much longer than hind tarsi. First segment of hind tarsi longer than all successive segments together. Body black. Antennae and legs reddish-rust. Body length 7.0 to 9.0 mm.

Material: Described from material collected in Amur and Ussuri-Primor'e region. Adults three (collection of the Zoological Museum, Moscow State University). Larva and pupa not known.

Distribution: Ussuri-Primor'e region; northeast China; north of Korean Peninsula. Emergence of adults in June and July. Quite rare.

3. **Clytus venustulus** Plav.

Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 412–413.

Adult (Figure 46): Similar to *C. nigritulus* Kr. Differs in presence of light-colored crossband behind elytral base, and notably shorter antennae. Body elongate. Head with dense rugulose punctation and fine light-colored hairs. Frons flat, elongate (spinelike) laterally near antennal base.

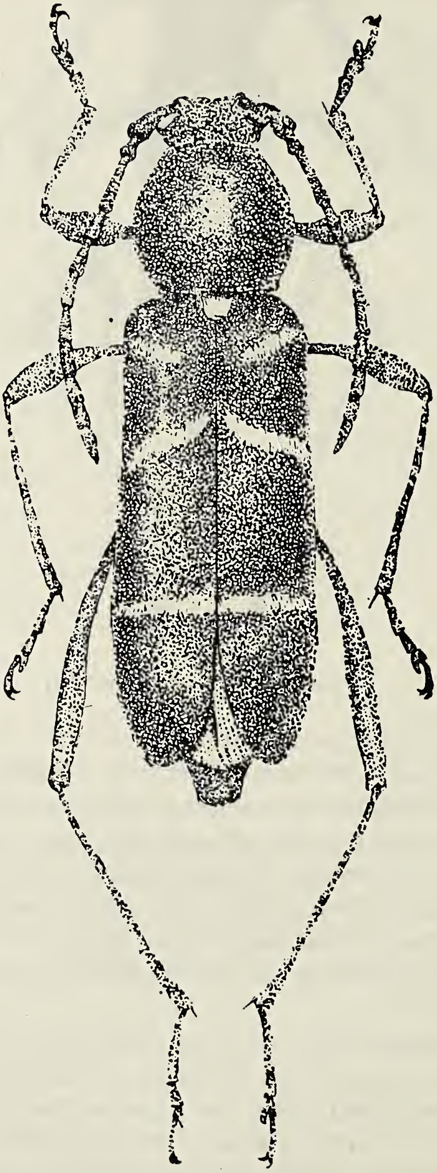


Figure 46. *Clytus venustulus* Plav.

Eyes narrowly and deeply notched. Antennae short, only 7th segment extends beyond elytral base, thicken toward apex, matte in 8th to 11th segments; 11th segment narrowly rounded apically, not longer than 10th 88 segment. Pronotum hemispherical, with dense flat buttonlike punctation, and thin long rusty hairs. Scutellum slightly depressed medially, with fine punctation, broadly rounded posteriorly, and in posterior half with adherent yellow hairs. Elytra convex, with parallel sides, elongate, obtusely rounded at apex, with dense rugulose punctation that is large at base and reduces toward apex, short semiadherent hairs, and transverse yellowish hairy bands. Hind femora slightly thickened, barely reach elytral apex. Hind tarsi much shorter than tibiae. First segment of hind tarsi longer than all successive segments together. Body black, with brownish tinge. Antennae rusty, darken apically. Legs reddish-rust. Elytra blackish-brown, with short oblique transverse stripe behind base; crossband before middle slants from lateral margin forward toward suture, but does not reach the latter; straight crossband behind middle; apex without yellow hairy border. Meso- and metasterna with yellowish hairy spot laterally. Abdominal sternites I to IV with narrow light-colored hairy border at posterior margin. Body length 8.0 to 9.5 mm.

Material: Described from material collected in Ussuri-Primor'e region. Adults three. Larva and pupa not known.

Distribution: Ussuri-Primor'e region. Rare. Beetles fly in June and July.

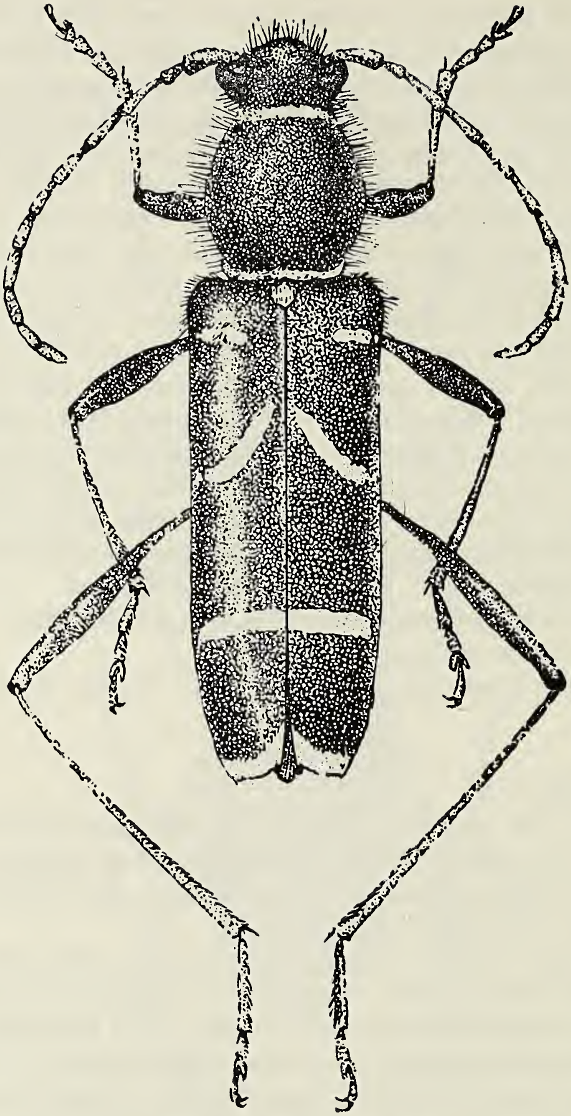
4. **Clytus arietis** (L.)

Linnaeus, 1758, *Syst. Nat.*, 10th ed., p. 399 (*Leptura*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 401–405; Duffy, 1953, *Monograph Immat. Stages of British and Imported Timber Beetles*, pp. 223–225; Demelt, 1966, *Tierwelt Deutschlands*, vol. 52, p. 76.

Adult (Figure 47): Very similar to *Clytus arietoides* Reitt. and *C. rhamni* Germ. Differs slightly from former in longer hind femora and from latter in dense fine punctation of elytra. Head with dense punctation and fine erect brownish hairs. Frons slightly convex or almost flat, with median longitudinal groove. Antennae thicken conspicuously toward apex; 7th and 8th segments extend beyond base of pronotum.

Pronotum on disk hemispherical, convex, barely produced at anterior and posterior margins, with very dense fine punctation, brownish erect setaceous hairs throughout surface, dense yellowish hairy border at anterior and posterior margins. Scutellum flat, broadly rounded anteriorly, with dense compactly adherent yellowish hairs.

Elytra with parallel sides, convex, with rounded humeri, broad depression on inner side of humeri, smoothly rounded at apex, sometimes with barely perceptible, produced, spinlike inner angle, with very dense

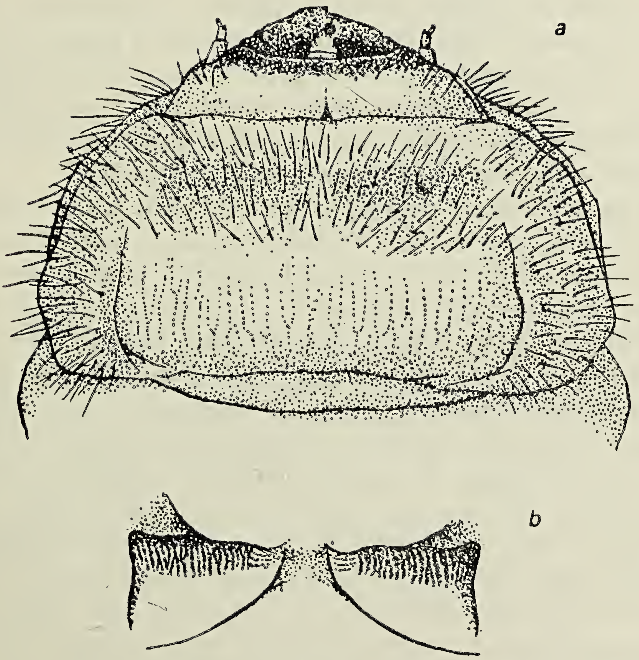


89 Figure 47. *Clytus arietis* (L.).

fine punctation (spaces between punctures thinner than dots) and very fine adherent hairs, at base behind scutellum with additional long erect brownish hairs, transverse yellowish hairy bands (of which anterior band short, in form of crossband on inner side of base of humeral tubercle; second band extends forward along suture, before middle; third band straighter, at beginning of posterior third), and broad yellow hairy border (f. *typica*). Sometimes second and third bands fuse in middle part (ab.

triangulimacula Costa) or third band fuses with apical border (ab. *heyrovskyi* Pic). Hind femora long; apices extend beyond elytral apex. Episterna of meso- and metathorax with dense adherent yellow hairs in 89 posterior half. Metasternum and abdominal sternites with broad yellow hairy border along sides of posterior margin. Body black. Antennae and legs rusty (f. *typica*), fore- and midfemora sometimes darkened (ab. *gazella* F.). Body length 7.0 to 13.0 mm.

Larva (Figure 48): Readily distinguished from larvae of other species of this genus by fine dense longitudinal striation of hypostoma. Head narrowly rounded anteriorly. Epistoma notably convex in anterior third, compressed at apex and here with reduced median chocolate-brown longitudinal suture, with faint frontal sutures laterally; anterior margin with rusty-brown border, small smooth notch near clypeus. Hypostoma convex, with thin dense longitudinal streaks in anterior half and here with brownish or rusty-brown tinge, rounded at inner angles of sclerites. Gular plate between sclerites of hypostoma broad, transverse, browner along sides of anterior margin. Parietals with stray (rare) long hairs, smooth brownish-rust border at anterior margin that covers antennal-ocular zone on lower side. Clypeus short, with brownish tinge. Labrum convex, whitish, angularly rounded at apex, with short light-colored



90 Figure 48. Larva of *Clytus arietis* (L.).
a—head and pronotum; b—hypostoma.

bristles along margins. Mandibles black, reddish-brown at base, with median longitudinal groovelike depression on outer side near base.

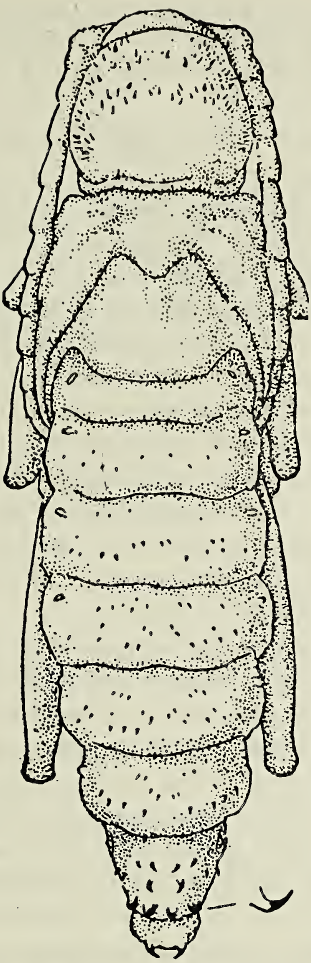
Pronotum narrows insignificantly anteriorly, slopes notably toward head, with two rectangular transverse spots in anterior half of disk, laterally with broad, longitudinally elongate, yellow spots, and before shields (including yellow spots) and laterally (excluding yellow spots) with thin, not very dense rusty hairs. Pronotal shield white, matte silver with fine sculpture posteriorly, hyaline and lustrous anteriorly, with fine
90 longitudinal streaks, narrow median longitudinal groove, bound laterally by deep longitudinal folds, and more or less produced forward in middle of anterior margin. Prosternum convex; presternum with short thin sparse rusty hairs. Eusternum glabrous without hairs, without groove along sides, and laterally not demarcated from presternum. Thoracic legs lacking.

Abdomen with short sparse hairs on sides. Dorsal locomotory ampullae convex, divided by common median longitudinal groove, with distinct groove toward front on tergites I to III, and indistinct transverse groove on tergites IV to VII. Ventral locomotory ampullae on sternites II to VI more convex, tubercular; on sternite VII slightly convex and form transverse carina. Body length of mature larvae up to 15 mm, width of head 2.5 mm.

Pupa (Figure 49): Characterized by presence of numerous acicular bristles on pronotum and arrangement of sclerotized spines on abdominal tergites. Head slightly narrower than prothorax, narrows cuneiformly ahead of eyes, with narrow longitudinal whitish stripe on occiput, and smooth median longitudinal groove between antennae. Antennae flexed to sides, with apices extending beyond abdominal tergite I.

Pronotum moderately convex, posteriorly with narrow transverse groove and bent margin here, uniformly smooth toward front, barely
91 rounded laterally, with numerous acicular bristles (forming one more or less definite crossband each near anterior margin, in middle, and on posterior slope), with stray small aristate spinules. Mesonotum with deep median transverse groove, short bristle before it laterally, and smoothly rounded scutellum on posterior margin. Metanotum convex, with narrow median longitudinal groove, and uniformly rounded on posterior margin; sides with barely perceptible bristles in anterior half forming row that extends obliquely from middle toward anterior angles.

Abdomen broadens at segment IV, narrows anteriorly and posteriorly. Abdominal tergites convex, with faint narrow median groove. Tergites I and II with minute spinules forming one transverse row. Tergites III to VI with large spinules in posterior half and minute spinules in anterior half forming transverse row in each, with paired spinules in middle along sides of longitudinal groove. Tergite VII with convex disk, trans-



90 Figure 49. Pupa of *Clytus arietis* (L.).

verse, narrows from anterior to posterior end, broadly rounded posteriorly, with four long acute spinules bent forward on posterior margin forming uniform transverse row; four sharp incurved spinules medially or immediately behind middle forming median transverse row; anterior half (near anterior margin) with four to nine shorter spinules bent backward and slightly medially form anterior transverse row or transversely elongate group. Tergite VIII transverse, broadly rounded posteriorly, with two to five large incurved spinules on posterior margin. Hind femora long, extend beyond middle of abdominal tergite VI. Body length 8.0 to 11.0 mm or more, width of abdomen 3.5 mm.

Material: Collected in northern Caucasus (Kislovodsk). Adults seven (beetles raised from larvae collected in nature), larvae seven, pupae—two males, larval exuviae from pupal cells with beetles and pupae three. Large number of beetles also examined from collection of the Zoological Museum, Moscow State University (Moscow) and the Zoological Institute (Leningrad).

Distribution: Atlantic coast to the southern Urals, Scandinavia to the Mediterranean Sea.

Biology: Inhabits deciduous forests. Ecologically associated with deciduous trees and shrubs. Emergence of adults observed from May to July. Female inhabits branches up to 1.4 cm in diameter. Larvae live under bark, make longitudinal galleries from top downward, deeply impressed in wood, and fill them compactly with fine frass. Walls of gallery suspended, sharp. After hibernation mature larva moves deeper into wood, makes longitudinal gallery there in upper layer of wood or in pith (in thin branches), with pupal cell at end of gallery, cuts an outlet in bark, fills it with frass, and pupates with head upward (toward exit). Length of gallery under bark of 8.0 to 26.4 cm, in wood 7.0 to 13.0 cm. Width of gallery under bark 0.5 to 1.0 cm, in wood 0.5 to 0.6 cm. Width of outer opening into wood 0.3 to 0.5 cm. Length of pupal cell 2.8 to 4.0 cm, width 0.5 to 0.6 cm.

Larvae pupate in second half of summer. Pupae enter diapause and overwinter in hibernation, which is a physiological requirement. Pupae that do not hibernate, especially in open pupal cell, usually die. For example, in one experiment a larva pupated on July 8 and the pupa was maintained at 17.2 to 22.0°C in the laboratory; it died on November 1st. In another experiment a larva pupated on July 26 and the pupa was first kept in the laboratory at 16.1 to 25.2°C, then transferred September 1st to a cold chamber at 5.0 to 10.0°C, and subsequently on December 1st to a temperature of 13.2 to 16.5°C. A beetle emerged from this pupa on December 11. Hence insects of this species have a two-year cycle of 92 development; the first hibernation occurs in middle-aged larvae and the second in the pupal stage (Table 4). Such a cycle of development is also characteristic of *Clytus arietoides* Reitt.

Table 4. Periods of development of *Clytus arietis* (L.)

Year of development	April	May	June	July	August	September	October
1st	P	PAE	AEL	EL	L	L	L
2nd	L	L	L	LP	LP	P	P
3rd	P	PAE	AEL	EL	L	L	L

Remark: Development given according to observations conducted in northern Caucasus (Kislovodsk).

Before pupation larvae (based on three specimens) range in weight from 24 to 52 mg, and pupae 18 to 42 mg. One larva weighed 38 mg before pupation (100%) and its pupa 33 mg (86.8%). Another larva weighed 56 mg (100%) and its beetle 39 mg (69.6%), i.e., weight decreased by 30.4% during metamorphosis.

According to published reports (Plavil'shchikov, 1940; Demelt, 1966), *Clytus arietis* (L.) lives on branches of oak, chestnut, hornbeam, filbert, and other deciduous trees. In northern Caucasus (Kislovodsk) we found it on dog rose, willow, and pear. Middle-aged larvae and pupae were found in March. Reportedly rare in the southern Urals and we did not find it there.

5. **Clytus melaenus** Bat.

Bates, 1884, *J. Linn. Soc. Lond. Zool.*, vol. 18, p. 230; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 80; Kojima and Okabe, 1960, *Food Plants of Jap. Cerambycidae*, p. 137.

Adult (Figure 50): In general development similar to *C. raddensis* Pic. Differs well in deep distinct punctation of pronotum, presence of distinct transverse hairy stripe behind base of elytra, and other characters. Frons broad, flat, with moderately dense punctation, light brownish erect and semiadherent whitish hairs. Vertex with very dense, longitudinally fused, rugose punctation. Eyes markedly convex, with narrow notch and finely faceted. Antennae thicken slightly (female) or just barely (male) toward apex; commencing from 5th segment covered with dense white (especially in female) adherent hairs, and extend beyond middle (male) or first third of elytra. Third antennal segment longer than 4th, equal to 1st; 11th segment acute (male) or narrowly rounded (female) at apex.

Pronotum more (male) or less (female) oblong, uniformly rounded laterally, narrows equally anteriorly and posteriorly, with narrowly turned margins at apex and base; disk markedly convex, matte (male) or lustrous (female), with distinct dense deep punctation, with spaces between punctures smaller (male) or almost not smaller (female) than punctures (in male, covered with secondary rough punctation), and comparatively dense erect brownish hairs. Scutellum broad, smoothly rounded at anterior end, with dense white adherent hairs in posterior half. Elytra elongate, with parallel sides, broadly truncate at apex, with produced, spinelike outer and inner angles; disk convex, depressed behind scutellum along suture but tubercularly raised along sides of suture, with
93 notably broad notch on inner side of humeral tubercle, in anterior half with very long erect, in posterior half short semiadherent brownish, and at apex with long sparse light-colored hairs, and white hairy crossband. Legs long and slender. Hind femora (male and female) reach far

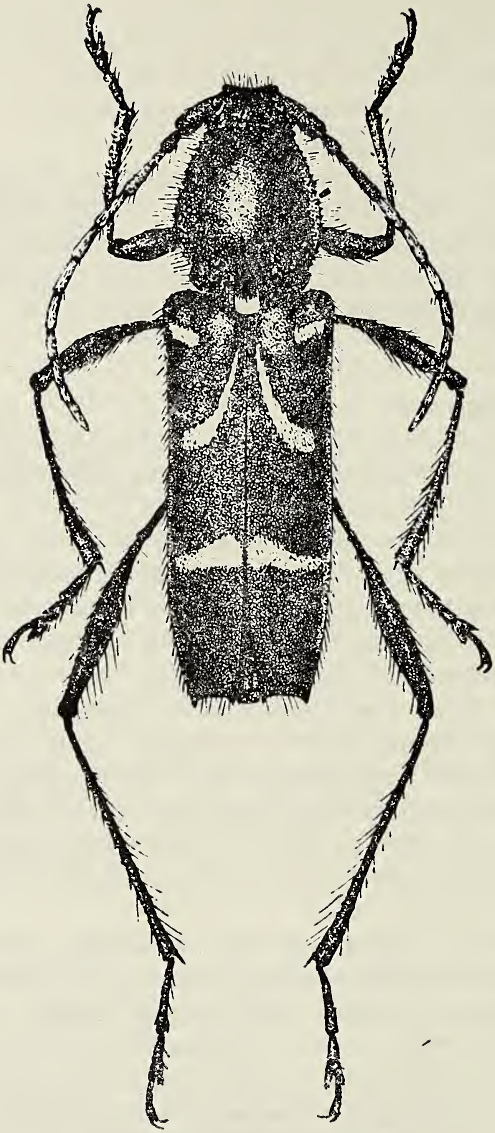


Figure 50. *Clytus melaenus* Bat.

beyond elytral apex. Hind tarsi less than 0.66 length of tibiae. First segment of hind tarsi much longer than all successive segments together. Body ventrally covered with erect and semierect brownish hairs.

Body black. Antennae black, with brownish tinge at apex in male. Legs black, apices of tibiae sometimes black, tarsi rusty or rusty-brown. Elytra black, with short transverse white hairy stripe behind base; band before middle extends forward from lateral side, bending near suture, and terminates in longitudinal postscutellar notch (lateral margin of band thicker, rounded, inner margin thin, pointed); crossband in posterior half reaches suture by inner margin (and broader here), reduces toward lateral outer margin (and markedly narrower here). Prosternum near forecoxae with longitudinal and mesosternum with transverse white spot; metathoracic episterna with longitudinally elongate, triangular, white, densely hairy spot. Metasternum on posterior margin with narrow, abdominal sternites I to IV with broad white hairy border on posterior margin, especially posterolaterally. Body length 9.0 to 11.0 mm.

Larva (Figure 51): Characterized by narrow brownish border on anterior margin of hypostoma, longitudinal pattern in anterior half of pronotal shield, and presence of fine sculpture on posterior end of shield.

Epistoma with broad smooth brownish-rust border on anterior margin, apically with indistinct median longitudinal suture that is not visible in remaining part, with small notch near clypeus. Frontal sutures lacking. Hypostoma with parallel sides, narrow brownish border on anterior margin, distinct notch near inner angles, smooth, without transverse wrinkles. Gular plate separates sclerites of hypostoma, with distinct median longitudinal groove near anterior margin. Parietals on anterior
94 margin with broad dark rust border that does not cover ocellus and

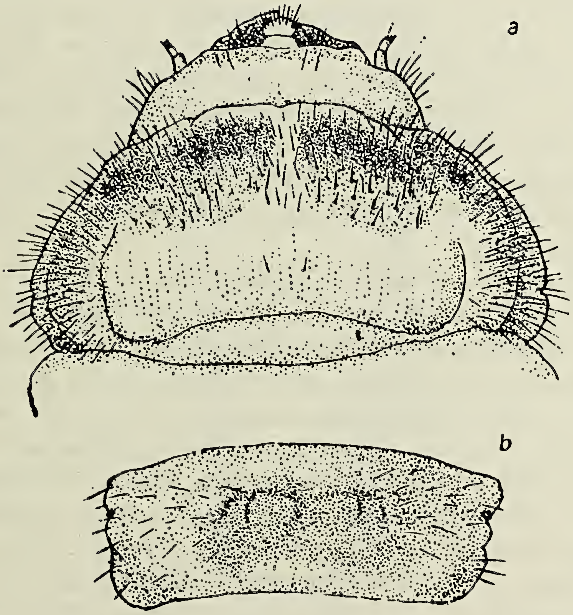


Figure 51. Larva of *Clytus melaenus* Bat.
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

antennal socket from behind, with sparse rusty hairs behind border forming crossband that extends from hypostomal sutures almost up to epistoma. Antennae short; apices barely extend beyond anterior margin of cephalic capsule; 2nd segment transverse, 0.50 length of 3rd. Ocellus small, hyaline, oval, its width 0.50 width of 1st antennal segment. Clypeus trapezoid, distinct at base. Labrum convex, not transverse, narrows more anteriorly, narrowly rounded at apex, and with sparse light rust bristles. Mandibles black, reddish-rust at base, very broadly rounded apically, and with narrow transverse groove on outer side of junction of black and red parts. Labial submentum not longer or slightly longer than wide, with stray very short bristles on sides. Maxillary palps protrude beyond apex of inner yellowish maxillary lobes, notably longer than labial palps.

Pronotum narrows toward front almost from posterior margin, rounded at anterior margin, slopes smoothly toward head, laterally with longer, on disk notably reduced and uniformly rusty hairs. Transverse rusty-yellow spots in anterior third of pronotum faint and, as in all species of *Clytus*, with hairs separated one from the other by white gap. Yellow spots on sides of pronotum lustrous, glabrous, and slightly longitudinally elongate. Pronotal shield convex, laterally bound by deep longitudinal grooves, transversely truncate at anterior margin, not produced anteriorly and at angles, only sometimes appears slightly notched near anterior angles; with fine sculpture in posterior third imparting
95 silvery tinge; anterior half with fine longitudinal pattern, lustrous, with narrow striae on back side broadening toward front. Prosternum laterally and on disk with uniform rusty hairs except for two large rounded glabrous sclerites in region of eusternum, which are separated by longitudinal groove, and with additional hairy clearance in anterior half. Thoracic legs lacking.

Abdomen narrows in region of segments I and II, further with parallel sides up to tip, with short, not very dense rusty hairs on sides; disk before and behind locomotory ampullae without hairs. Dorsal locomotory ampulle moderately convex, with common narrow median longitudinal groove, fine sculpture imparting silver tinge, and laterally with indistinct outcurved folds. Ventral locomotory ampullae with fine sculpture, laterally with longitudinal curved folds, disk with indistinct transverse groove from which short longitudinal wrinkles originate. Body length of mature larvae 18 to 19 mm, width of head 2.3 mm.

Pupa (Figure 52): Differs from pupa of other species of the genus in shape and arrangement of spinules on pronotum and abdominal tergites. Head with broad longitudinal channel-like groove between antennae, broadly rounded at occiput, without acicular bristles on facial side. Antennal apices extend beyond posterior margin of elytra and here turn slightly toward ventral side. Pronotum fairly convex, much longer than wide, narrows gradually anteriorly and more sharply posteriorly, with or without perceptible narrow transverse groove near posterior margin, with large aristate acute spinules on sides and in anterior half bent inward, with paired paramedial aristate spinules on posterior margin bent forward. Individual spinules on sides of pronotum with slightly produced leathery base. In pupa of *Clytus raddensis* Pic this base is highly smoothened and elongate. Mesonotum slightly wider than long, moderately convex, with indistinct transverse streaks, barely elongate and smoothly rounded shield, and distinct notch posterolaterally. Metanotum slightly convex, with distinct median longitudinal groove, broadly rounded posteriorly, with faint transverse streak on disk.

Abdomen elongate, broadens slightly in region of segments III to V, and narrows gradually posteriorly. Abdominal tergites convex, with indistinct median longitudinal groove; small spinules in posterior half form broken line that extends forward angularly along middle part and under

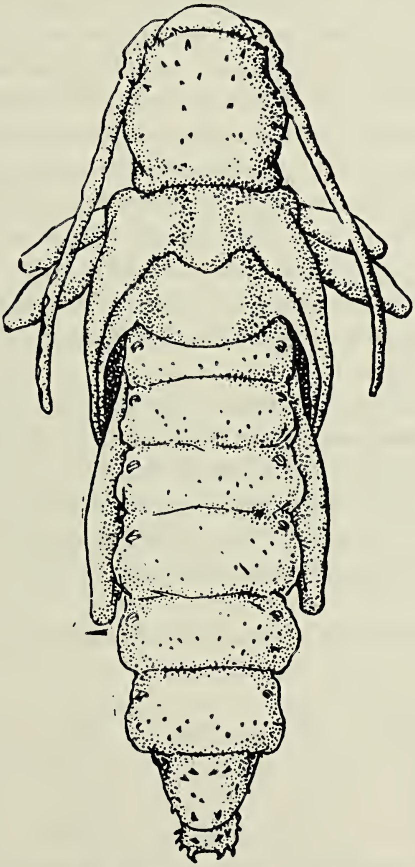


Figure 52. Pupa of *Clytus melaenus* Bat.

angle toward back side along sides of tergites. Abdominal tergite VII oblong, narrowly or broadly rounded posteriorly; posterior margin with three to five spinules bent forward, six to eight spinules behind middle, and six to eight incurved spinules in anterior half that form one or two transverse rows. In some specimens spinules in anterior half form not one but two transverse rows, and thus four rows of spinules occur on tergite VII, with one behind middle and two in anterior half. Tergite VIII transverse, broadly rounded posteriorly; four spinules on posterior margin bent inward and forward and paired spinules in anterior half on sides bent inward. Body length 12 to 18 mm, width of head 3.5 mm.

Material: Collected from Kunashir Island (Alekhino). Adults nine, larvae 18, pupae—three males, larval exuviae with beetles from pupal cells seven.

96 *Distribution*: Kunashir Island; Japan.

Biology: Found in broad-leaved and mixed forests in which oak grows. Emergence of beetles at end of June and in July. Female lives on drying branches (twigs) of thick-stemmed viable oak trees. Diameter of branches 2.0 to 4.0 mm. Larvae first live under bark, make longitudinal meandering galleries, impressed on alburnum, and fill them with fine frass. They bore into wood before second hibernation, also make longitudinal meandering galleries there, and fill them compactly with frass. Pupal cell made at end of gallery along branch in outer layer of wood, with outlet cut to surface supported in bark. One pupal cell was found in bark itself. This happens perhaps when bark on branches comparatively thick. Larvae remain in pupal cell for second winter and pupate in spring of the following year. Pupa oriented in pupal cell with head toward outlet. Width of gallery before pupal cell 5.0 to 6.0 mm. Length of pupal cell 25 mm, width 6.0 mm.

Pupae found in May and June. Young beetles develop toward end of June, emerge from wood later this month or in first half of July, and leave round openings up to 3.0 mm in diameter on surface of branches. In June medium-aged larvae are found under bark simultaneously with pupae and beetles in wood. This indicates that the complete cycle of development of this species takes two years (Table 5).

Table 5. Periods of development of *Clytus melaenus* Bat.

Year of development	April	May	June	July	August	September
1st	L	LP	LPAE	AEL	EL	L
2nd	L	L	L	L	L	L
3rd	L	LP	LPAE	AEL	EL	L

Clytus melaenus Bat. damages only oak. We did not find it on other plants.

6. **Clytus raddensis** Pic

Pic, 1904, *Echange*, vol. 20, p. 18; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2; 413–415; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 80.

Adult (Figure 53): Characterized by variable punctation on pronotum and presence of white bands and white hairy spot on humeri of elytra. Body elongate. Head markedly retracted into prothorax. Frons flat or slightly convex, with fine flat punctation, short white, sometimes not very dense, bent hairs and long fine erect hairs. Vertex slightly depressed behind antennae, with large flat alveolate punctation, and setaceous erect hairs. Eyes convex, almost hemispherical, deeply notched on inner side. Antennal apices extend beyond posterior margin of anterior band on elytra (male) or slightly short of it (female). Third antennal segment notably longer than 5th, equal to or slightly longer than 1st.

Pronotum convex, its length barely more (male) or not more than width in middle (female), equally rounded anteriorly and posteriorly or smoothly anteriorly and abruptly narrower posteriorly, sometimes with longitudinal broad notches laterally on upper surface, with thin erect, sometimes bent white hairs, and flat large or fine, well demarcated or fused punctation. Spaces between punctures with secondary punctation,
97 matte; punctures themselves smooth, lustrous. Sometimes punctures so greatly reduced that spaces between them fuse and impart general matte texture to pronotum or, contrarily, punctures fuse and spaces between them become isolated folds. Scutellum broad, flat, smoothly rounded posteriorly, with dense white compactly adherent hairs in posterior half. Elytra elongate, with parallel sides, moderately convex, with distinct humeral tubercle and short longitudinal depression on its inner side, and here with or without hairy spot; usually obliquely truncate at apex; sometimes with produced spinelike inner angle covered with notchlike punctation, with semiadherent (more whitish at apex) hairs, two white hairy crossbands (anterior one before middle bends markedly forward along suture and slightly short of reaching scutellum; posterior bands behind middle, meet at disk but short of lateral margins of elytra, and usually bend slightly forward near suture). Legs comparatively long; hind femora (male and female) extend beyond elytral apex. First segment of hind tarsi almost 3.0 times longer than two successive together. Body black. Elytra dark brown. Antennae and legs dark brown, with rusty tinge. Pro-, meso-, and metasterna, as well as abdominal sternites with whitish hairy spot laterally. Body length 7.0 to 12.5 mm.

Egg: Quite elongate, broadly rounded or slightly obtuse at anterior pole, narrows more toward posterior pole and usually narrowly rounded.

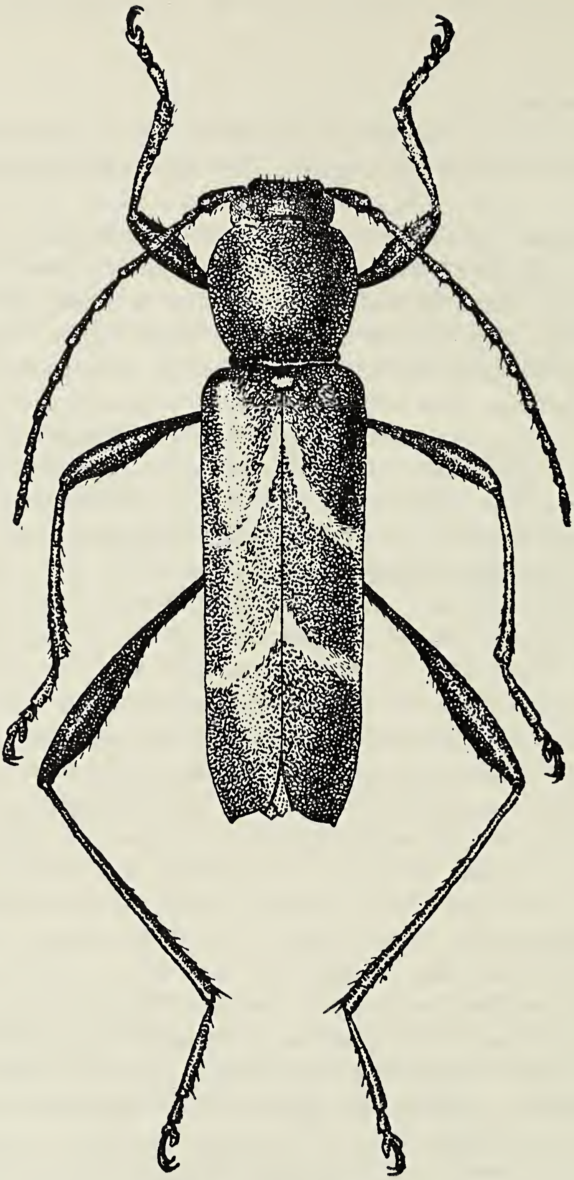


Figure 53. *Clytus raddensis* Pic.

Chorion smooth, hyaline, translucent. Length 1.5 mm, width 0.5 mm.

Larva (Figure 54): Readily identified by broad rusty-brown border on anterior margin of parietals completely covering ocellar-antennal area on back side, shape of pronotal shields, and other characters. Epistoma with narrow and sharply protruding smooth brownish border on 98 anterior margin, laterally fuses with parietals, without perceptible notch near clypeus, slightly convex, and with barely perceptible apical median suture. Hypostoma narrows slightly anteriorly, slightly convex, with narrow smooth brownish border on anterior margin, behind which transverse wrinkles lacking or barely perceptible, with rounded anterior outer angles and sharp produced inner angles. Parietals with individual hairs laterally, broad rusty-brown border on anterior margin covering ocellus and antennal socket from behind (in *C. melaenus* Bat. border narrower and does not cover ocellus from back side). Ocellus near antennal base small, slightly oval, almost rounded. Antennae short, apices barely extend beyond anterior margin of cephalic capsule. Clypeus whitish or slightly brownish, trapezoid, its width at apex 2.0 times length. Labrum narrows slightly toward base and more toward apex, with rounded anterior margin, and short rusty bristles. Mandibles basally red, black in anterior half, on outer side near base with transverse, and medially with curved grooves. Inner lobes of maxillae thick, yellowish; apex whitish and here, along lower margin, with thin light-colored bristles. Maxillary palps protrude conspicuously beyond apex of inner lobes. Labial mentum transverse, broadens toward apex, and with cluster of rusty bristles on sides.

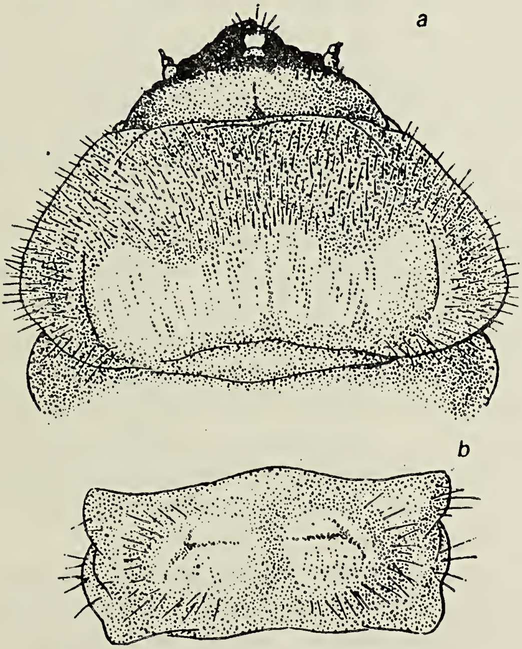


Figure 54. Larva of *Clytus raddensis* Pic.
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

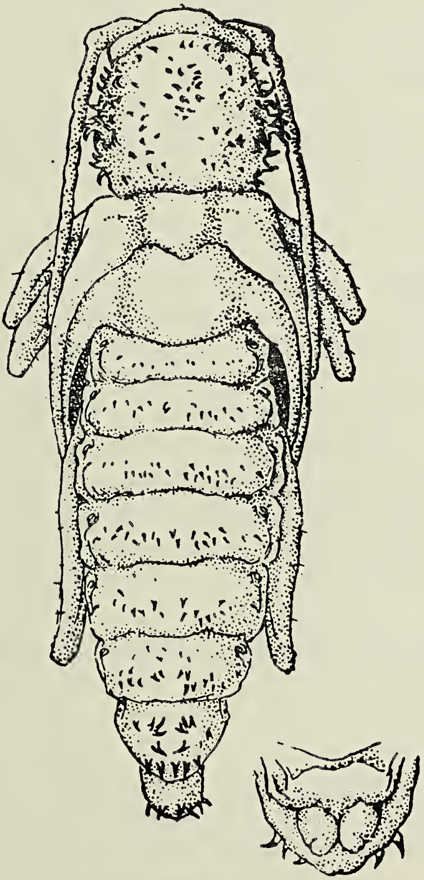
Pronotum broad, narrowly rounded in anterior half, with uniform rusty hairs before shield on disk and laterally. Pronotal shield protrudes sharply, convex, on anterior margin medially and in anterior angles 99 markedly produced (hence appears deeply bidentate), with uneven longitudinal streaks; only posteriorly with fine sculpture, imparting silvery tinge, in form of narrow border (in *C. melaenus* Bat. fine sculpture covers almost posterior third of shield); laterally bound with long deep longitudinal grooves. Near these grooves alar lobes glabrous, without hairs. Yellowish transverse spots in anterior third of pronotum and longitudinally elongate spot on sides diffuse, faint. Prosternum with uniform rusty hairs except on glabrous rounded sclerites of eusternum, which are divided anteriorly by cuneiform elongate hairy field that extends almost up to posterior margin (in *C. arietoides* Reitt. and *C. melaenus* Bat. eusternum divided by hairy field only up to middle). Thoracic legs lacking, in form of small caruncles in some larvae only before punctation.

Abdomen with short light rust hairs on sides, disk toward front and back side with locomotory ampullae, without hairs. Dorsal locomotory ampullae barely convex, with shallow median longitudinal groove, laterally bordered by outcurved fold, with uniform fine sculpture imparting silvery tinge; disk sometimes with longitudinal wrinkles. Ventral locomotory ampullae with fine sculpture, abdominal sternites I to III with median transverse groove, and longitudinal wrinkles originating from it that are barely perceptible; remaining sternites with or without distinct longitudinal folds. Abdominal sternite IX with long hairs on posterior margin forming crossband or transverse row. Body length of mature larvae 16 to 20 mm, width of head 2.8 mm.

Pupa (Figure 55): Differs well from other species of the genus *Clytus* in presence of thick leathery base near spinules located on sides of pronotum, and acicular bristles on facial side of head. Head between antennae with smooth groovelike longitudinal depression, broadly rounded occiput, flat vertex and here with three spinelike or thin bristles behind antennae forming transverse row, with one or two bristles on inner side of antennal base, four to eight paired bristles on anterior margin of frons near clypeus. These bristles are well defined in some specimens, in others minute but distinct under high magnification. Antennae uniformly thick, apices flexed to sides of elytra.

Pronotum broadens behind middle, narrows gradually anteriorly and more abruptly posteriorly, without perceptible or with barely perceptible transverse groove near posterior margin; width slightly more than length; uniformly convex on disk, with very large or fine aristate spinules extending toward center of disk (toward middle); and broad or small glabrous sclerite behind middle of posterior slope. In latter case pronotum appears continuously covered with spinules, Spinules on sides of pronotum (especially behind middle at broadest place) with produced, very thick leathery base. Mesonotum barely convex, glabrous, with narrowly produced shield. Metanotum lustrous, without transverse streaks, with narrow median longitudinal groove, and stray short bristles laterally in anterior half.

Abdomen elongate, distinctly or slightly broadens in segments III to IV, and markedly narrows toward tip. Abdominal tergites more convex in posterior half and here with large acute or comparatively fine spinules directed backward and forming transverse stripe or jumbled row. Tergite VII moderately elongate, apically rounded, usually with six to 10
100 large spinules on posterior margin bent inward and forward or erect, ahead of which pair (sometimes apical) of incurved spinules occur; in anterior half with three to eight incurved spinules forming transverse



98 Figure 55. Pupa of *Clytus raddensis* Pic, female.

row or crossband. Tergite VIII slightly shorter than width at anterior margin, with six to ten spinules on posterior margin bent toward both sides, ahead of which one to two almost paramedial spinules occur or latter absent. Valvifers of female hemispherical, adjacent, with laterally produced apical tubercle. Body length 13 to 16 mm, width abdomen about 4.0 mm.

Material: Collected in Ussuri-Primor'e region. Adults 108, larvae 63, pupae—four females, larval and pupal exuviae with beetles eight.

Distribution: Southeast in eastern Siberia (including Ussuri-Primor'e region); northeast China, northern Korean Peninsula, Japan.

Biology: Inhabits broad-leaved and mixed forests, tropically associated with many deciduous trees. Larvae hatch from mid-June to August; at time of reproduction found on trees inhabited by them, very rarely and possibly incidentally appear on flowers. Female lays eggs singly in bark crevices of drying branches 3.0 to 7.0 cm or more in diameter. Larvae hatch from eggs at 15.8 to 20.8°C after 18 to 20 days.

Larvae initially live under bark, later in wood, make longitudinal meandering galleries, and fill them with fine frass. Width of gallery in wood 5.5 to 9.0 mm. Pupal cell made at end of gallery along branch in upper layer of wood, filled with frass, and with exit cut up to bark. Length of pupal cell 18 to 35 mm, width 4.0 to 7.0 mm. Larva pupates with head toward exit.

Pupation begins end of May and ceases mid-June. Pupae develop for about three weeks. For example, in the laboratory a larva pupated on January 3rd and the beetle emerged January 23. Atmospheric temperature during this period ranged from 14.4 to 20.0°C (average 17.5 ± 0.2°C). Young beetles emerged from wood mainly in second half of June or early July, leaving round openings on bark surface up to 3.5 mm in diameter. Beetles emerge from wood with developed gonads. For example, ovaries of a female just emerged from pupal cell contained 18 large mature eggs. In another female collected in nature, 27 eggs were found in the ovaries. Beetles commence reproduction soon after emergence from wood, and live for two weeks or more. Generation completed in two years.

Clytus raddensis Pic damages undergrowth, rarely lives on drying twigs of trees with thick trunks, or trunks of various deciduous trees with thin bark. We obtained 78 beetles from larvae collected from fallen trees in forests: 20 on ash, 17 pseudoacacia, 10 pear, nine oak, five birch, four apple, three hawthorn, two each plum and lespedeza, and one each on elm, black cursant, walnut, oak, spindle tree, and apricot. In addition 75 specimens (larvae, pupae, beetles) were collected from branches during an inspection of forests: 16 from oak, 15 pear, nine pseudoacacia, 12 ash, six hawthorn, four plum, three lespedeza, three spindle tree, two willow, and one each from birch, apricot, apple, Amur oak, and maple.

101 7. **Clytus hypocrita** Plav.

Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 416–417.

Adult: Differs from the proximate species (*C. raddensis* Pic) in apically rounded elytra, and broader, rarely punctate pronotum. Frons flat, slightly depressed between antennae, with dense punctation, and erect light-colored hairs. Vertex depressed, with dense flat punctation, with spaces between punctures narrow and saccate. Antennae thicken slightly toward apex, with grayish adherent hairs; apices reach posterior third of elytra.

Pronotum narrowly rounded in posterior third, with almost parallel sides toward front, narrow constriction near base, uniformly convex disk, and large uniform punctation; spaces between punctures not narrower or narrower than dots, with long erect brown hairs. Scutellum flat, narrowly rounded apically, with dense adherent white hairs in posterior half.

Elytra with parallel sides, convex, broadly depressed on inner side near humeral tubercles, broadly rounded apically, with sparse punctation at base and dense punctation in remaining part, with minute semiadherent brownish or light-colored hairs, and two white crossbands. Hind femora extend far beyond elytral apex.

Body black. Antennae brownish-rust. Tibiae and especially tarsi rusty. Elytra with white hairy spot near base, white hairy crossband before middle that extends from lateral margin inward and forward up to suture, and hairy crossband in posterior half. Elytral apex with sparse long white hairs. Episterna of meso- and metathorax with white hairy spot; metathorax and abdominal sternites I to IV with white hairy border along posterior margin interrupted medially. Body length 9.0 mm.

This species is very similar to *C. raddensis* Pic and difficult to distinguish from it.

Material: Known from the type specimen preserved in the collection of the Zoological Museum, Moscow State University (July 31, 1917. El'skii). Additional studies are required to confirm the validity of this species.

8. **Clytus fulvohirsutus** Pic

Pic, 1904, *Echange*, vol. 20, p. 18; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 417–418; Cherepanov and Cherepanova, 1975, *Zhuki-drovoseki ivovykh lesov Sibiri*, pp. 108–111.

Adult (Figure 56): Readily distinguished from other species of the genus by presence of dense erect hairy cover on pronotum, at base of elytra, and on legs, and by two white hairy bands on elytra. Head in region of frons and vertex with dense flat punctation (spaces between punctures narrow, septate), and long light-colored or brownish hairs. Antennae thickened notably toward apex, with adherent gray hairs; apices reach first band on elytra (female) or extend slightly beyond it (male). Fourth antennal segment shorter than 3rd, equal to 5th.

Pronotum slightly oblong, smoothly rounded on sides, with barely perceptible transverse groove near base, uniformly convex disk, with very dense deep punctation (spaces between punctures smaller than dots) and dense erect brownish hairs imparting impression of being highly setaceous. Scutellum almost semicircular, with dense adherent whitish hairs.

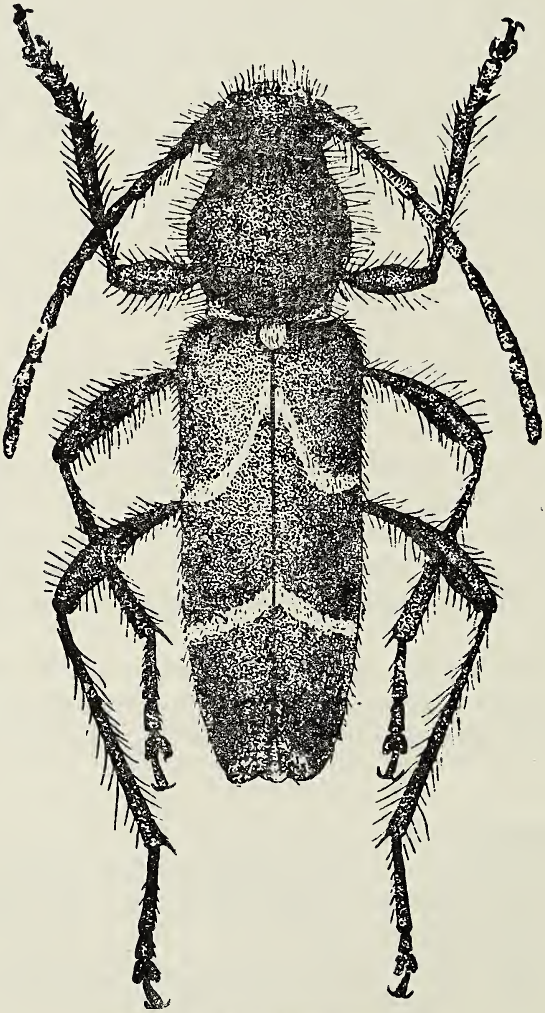


Figure 56. *Clytus fulvohirsutus* Pic.

102 Elytra with parallel sides, moderately convex, obtusely rounded at apex with rounded angles, somewhat large punctation at base up to first band, fine dense rugose punctation behind it, first third with erect, and remainder with semiadherent brownish hairs, and two white hairy crossbands. Legs slender; hind femora barely reach elytral apex (female) or extend slightly beyond it (male). Body black. Antennae dark rust. Legs black, tibiae and tarsi often with rusty tinge. Anterior white hairy band on elytra before middle with outer end not reaching lateral margin, its inner end bending smoothly near suture and extending forward; posterior crossband broadens near suture, narrows towards side, but does not reach lateral margin of elytra. Humeral white spot and white border at apex of elytra absent. Prosternum and mesosternum with white hairy spot on sides. Episterna of metathorax with long triangular white hairy spot. Abdominal sternites I to IV with broad white hairy border interrupted medially. Body length 5.0 to 10.0 mm.

Egg: White, elongate, broadly rounded at anterior pole, narrows toward posterior pole and pointed or narrowly rounded here. Chorion lustrous, smooth, translucent. Length 1.1 to 1.2 mm, width 0.4 mm.

Larva (Figure 57): Differs from other species in barely perceptible or almost imperceptible ocellus near antennal base, structure of pronotal shield, and other characters. Head with parallel sides, but slightly narrower in anterior third. Epistoma broadly notched on anterior margin, with sharply protruding lustrous brownish border, behind which three long hairs form transverse row; apex with longitudinal suture reduced to line. Frontal sutures not visible. Hypostoma with parallel sides, smooth, lustrous, with sharply protruding narrow brownish border on anterior margin, straight or insignificantly rounded outer angles, and sharply produced inner angles. Gular plate narrows toward front, even, without median longitudinal groove. Parietals with brownish-rust border
103 on anterior margin that does not cover antennal sockets from behind, and thin light-colored hairs in middle forming transverse stripe. Clypeus trapezoid, with two distinct brownish spots on anterior margin. Labrum oblong-oval, convex, disk glabrous, with light-colored bristles along margins. Mandibles broadly rounded at apex, flattened or longitudinally depressed on outer side at base, black, but dark red at base. Labial mentum narrows markedly toward base, laterally in anterior half with thin piliform bristles forming one group on each side. Inner masticatory lobes of maxillae thick, truncate at apex, and barely shorter than maxillary palps.

Pronotum with parallel sides in posterior half, narrows slightly in anterior half, slopes insignificantly toward head, with very smoothly rounded anterior margin; disk with two yellow transverse spots in anterior third, glabrous, smooth, longitudinally elongate yellow spot laterally,

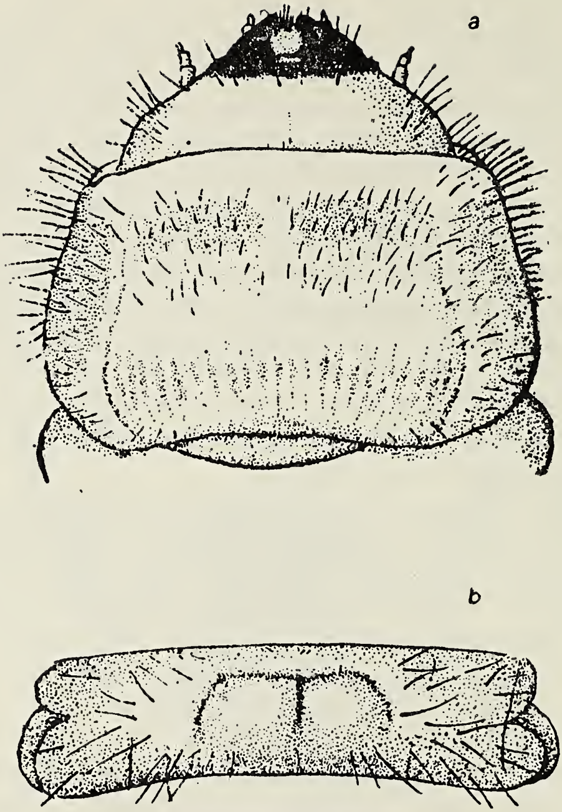


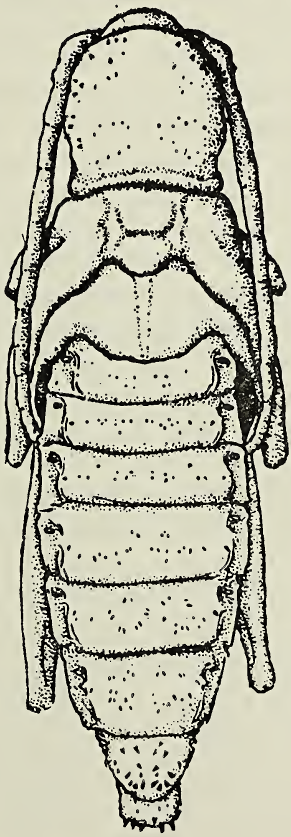
Figure 57. Larva of *Clytus fulvohirsutus* Pic.
a—head and pronotum; b—abdominal tergite
with dorsal locomotory ampulla.

with rusty even hairs before shield and along sides, without hairs on
posterior margin of yellow spots in some specimens. Pronotal shield
convex, bound laterally by deep longitudinal grooves, straightly truncate
and entire on anterior margin, neither produced medially nor at ante-
rior angles, with longitudinal streaks; sometimes distinct or faint trans-
verse brownish stripe present, or stripe absent. Presternum with uniform
dense rusty hairs on disk and along sides. Glabrous sclerites in region
104 of eusternum separated by hairy field; posterior half entire (not divided),
and constitutes glabrous (hairless) transversely produced sternellum. Tho-
racic legs lacking, only rarely (female) present before pupation in form
of small caruncles.

Abdomen narrows slightly and gradually toward apex, laterally with tender light-colored hairs. Dorsal locomotory ampullae slightly convex, shagreen, divided by common median longitudinal groove, sides with short longitudinal grooves, and anterior margin sometimes with distinct transverse groove. Ventral locomotory ampullae with indistinct transverse groove on disk, from which longitudinal wrinkles originate. Body length 10 to 14 mm, width of head 2.1 mm.

Pupa (Figure 58): Differs from pupae of other species in shape and arrangement of spinules on pronotum and abdominal tergites. Head broadly rounded on occiput, flat on vertex, with longitudinal groove between antennae, barely perceptible transverse streaks in anterior half of frons, and without bristles. Antennae comparatively slender, flexed to sides, with apices extending beyond posterior margin of elytra.

Pronotum barely longer or even equal to width, uniformly convex, rounded laterally, with narrow transverse constriction posteriorly, with short, straight, randomly scattered spinules on sides and posterior slope near posterior margin, and small glabrous smooth spineless patch behind middle of disk. Mesonotum glabrous, with saddle-shaped transverse constriction, small notch laterally near elytral base, and produced scutellum



103 Figure 58. Pupa of *Clytus fulvohirsutus* Pic.

on posterior margin. Metanotum moderately convex, with deep median longitudinal groove, especially in anterior half.

Abdomen elongate, narrows gradually posteriorly from segment V. Abdominal tergites convex, with narrow indistinct median longitudinal groove, in posterior half immediately behind middle with short straight spinules forming transverse narrowly interrupted median stripe that curves slightly forward. In some specimens anterior half with minute spinules forming transverse row. Tergite VII narrows from anterior to posterior margin, rounded posteriorly; posterior half with acute or obtuse larger spinules forming common group or arranged in three transverse rows (hind row with four to five, middle row three to six, and front row with two to four spinlues); anterior half with two to four small spinules before midpoint forming transverse row, or without them. Tergite VIII not transverse, rounded posteriorly, with two to six minute spines on posterior margin forming transverse, sometimes uneven row. Body length 9.0 to 12.0 mm, width of abdomen 2.0 to 2.5.

Material: Collected in Ussuri-Primor'e region. Adults 137, larvae 21, pupae—three males, larval exuviae with beetles from pupal cells 18.

Distribution: Lower Amur region, Ussuri-Primor'e region.

Biology: Inhabits broad-leaved forests. Adults emerge from June to mid-August. Beetles often appear on flowers, collect pollen. Female oviposits in crevices of bark and twigs (diameter 1.2 to 8.0 cm) of dried and drying trees. Period of egg development at 20°C: 18 to 22 days.

Larvae live under bark, make longitudinal, sometimes meandering galleries, deeply impressed in upper layer of wood, and fill them compactly with fine frass. Length of gallery under bark made in upper layer of wood 12.0 to 14.5 cm, width up to 5.0 mm. Before pupation larvae 105 move deeper into wood and make pupal cell longitudinal to trunk in upper layer. Pupal cells often made under bark as well. Length of pupal cell 18 to 28 mm, width 4.0 to 6.0 mm. Pupation observed in May and June. Pupae found up to July. Young beetles cut round openings 2.0 to 3.5 mm in diameter on surface of branch, and emerge from pupal cell in June and July. Weight of larvae before pupation varies from 11.0 to 51.1 mg, of pupae 10.0 to 43.5 mg, and beetles before emergence from wood 9.0 to 37.1 mg (Cherepanov and Cherepanova, 1975).

Clytus fulvohirsutus Pic develops mainly on oak and elm, rarely on other trees. For example, 95 beetles developed from larvae collected in forests: 54.7% on oak, 8.4% elm, 9.4% hornbeam, and 27.5% on other trees (*Crataegus*, *Salix*, *Morus*, *Aralia*, *Pyrus*, *Fraxinus*, *Phellodendron*, *Acer*, *Malus*, *Maakia*, *Betula*, *Padus*, *Tilia*, *Viburnum*). In addition 31 specimens (larvae, pupae, beetles) were found in wood while examining forests: 10 on oak, three hawthorn, five maple, four hornbeam, three elm, two willow, and one each linden, cork, alder, and mulberry.

3. Genus *Brachyclytus* Kr.

Kraatz, 1879, *Deutsch. Entom. Z.*, vol. 23, p. 107; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 418–419; Mamaev and Danilevskii, 1975, *Lichinki zhukov-drovosekov*, p. 209.

Adult: Readily identified on basis of antennal sculpture and elytral pattern. Head short, frons black, with fine dense punctation. Antennae short, thicken toward apex. Pronotum hemispherical, convex, with dense punctation, long erect dense hairs, and dense narrow light-colored hairy border on anterior and posterior margins. Scutellum triangular. Elytra reddish-rust at base, with oblique light-colored hairy band before middle, and behind it crossband that broadens near suture and narrows toward sides, broadly rounded at apex, without light-colored hairy border.

Larva: Characterized by head markedly retracted into prothorax, wiih one hyaline ocellus near antennal base, and broadly shifted sclerites of hypostoma. Pronotum with pair of rusty rectangular transverse spots in anterior third bearing large whitish punctation. Thoracic legs lacking. Locomotory ampullae of abdomen sufficiently convex, with thin shagreen sculpture.

Pupa: Differs well from pupa of other species in position of numerous spinules on pronotum and abdominal tergites. Abdominal tergite VII appears enveloped by even spinules on posterior margin forming uniform row, which curves slightly backward.

The genus *Brachyclytus* Kr. consists of one species, distributed in the eastern regions of Asia. It belongs to relict fauna inhabiting broad-leaved forests since the Tertiary period.

Type species: Brachyclytus singularis Kraatz, 1879.

1. **Brachyclytus singularis** Kr.

Kraatz, 1879, *Deutsch. Entom. Z.*, vol. 23, p. 107; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 419–420; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 261; Kojima and Hayashi, 1960, *Insect Life in Japan*, vol. 1, p. 81; Cherepanov and Cherepanova, 1974, *Usachi vinograda amurskogo*, pp. 36–41.

Adult (Figure 59): Body moderately elongate. Head short, with dense rugose punctation, sparse adherent yellowish and erect brownish hairs, with or without smooth longitudinal stripe on frons, and uniformly
106 rounded at vertex and occiput. Eyes large, slightly convex, as though flattened, with minute facets, narrowly angular on inner margin. Antennae short, with apices reaching beyond elytral base by 5th to 10th segments, matte and highly thickened; 11th segment pointed at apex.

Pronotum slightly transverse, slightly wider in middle than long (female); or not transverse and equal in width and length (male), uniformly rounded on sides, narrows equally anteriorly and posteriorly, disk hemispherical, convex, with fine and very dense punctation, dense long erect hairs, slightly bent on anterior and posterior margins and here with dense narrow light-colored hairy border. Scutellum triangular, flat, comparatively broad, with fine punctation.

Elytra with parallel sides, convex disk, rounded humeri with barely perceptible longitudinal notch on inner side, broadly rounded at apex, with very fine dense punctation, minute adherent hairs that appear combed from suture toward lateral side. Femora with long thick clava and short thin shaft. First segment of hind tarsi much longer than all successive segments together. Body ventrally with long setaceous semiadherent

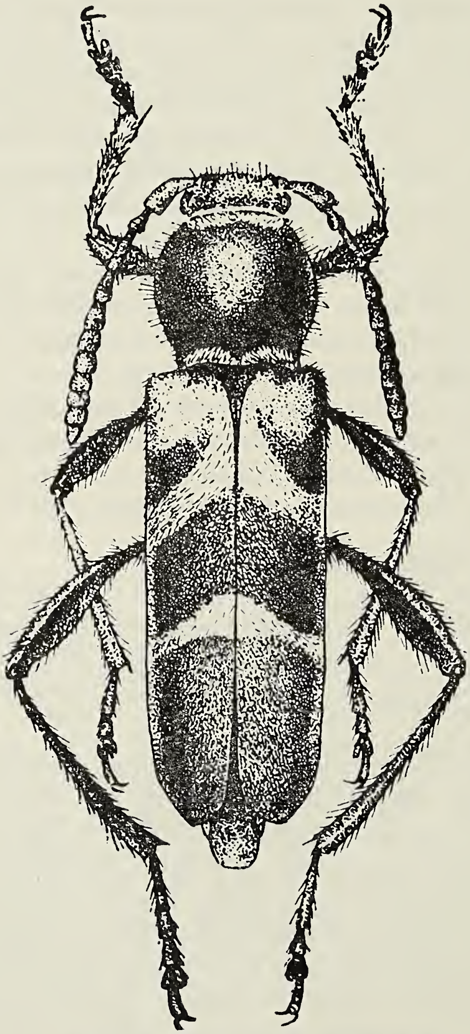


Figure 59. *Brachyclytus singularis* Kr.

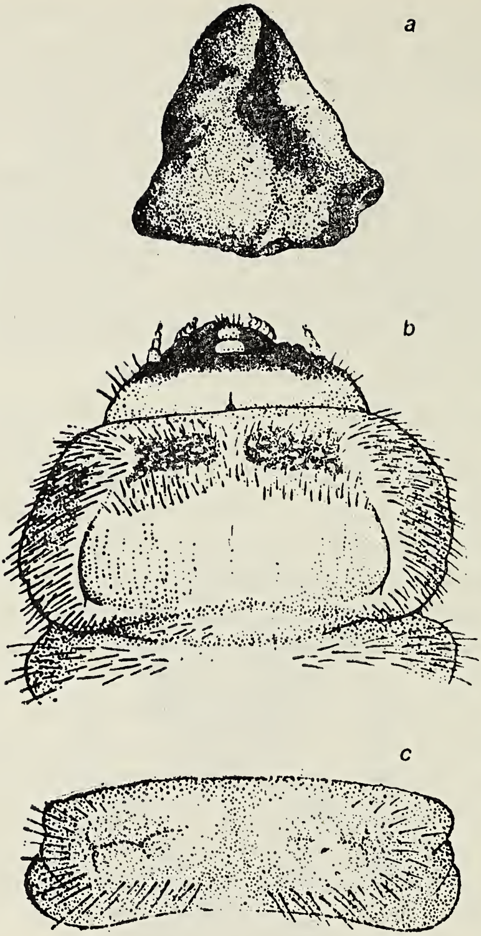
hairs. Episterna of meso- and metathorax with dense white adherent hairs in posterior half. Abdominal sternites I to II with broad border on posterior margin, with uniformly dense hairy whitish or yellowish border on disk curving toward sides. Body black. Antennae rusty, darker brown toward apex. Legs rusty-brown. Scutellum black. Elytra reddish-rust at base, with two transverse light yellowish bands. One band before middle, extends from sides obliquely toward suture and forward, without reaching scutellum; second band behind middle, broadens near suture and narrows gradually toward sides. Body length 8.0 to 13.0 mm.

Egg: Quite elongate, broadly rounded at anterior pole, and slightly pointed at posterior one. Chorion smooth, lustrous, without visible sculpture, translucent. Length 2.1 mm, width 0.6 mm.

Larva (Figure 60): Head markedly retracted into prothorax, narrows insignificantly toward front. Epistoma convex, with dark brown border on anterior margin, slightly depressed at apex and here with short brownish median suture, laterally not demarcated but fused with parietals, frontal sutures not vissible. Hypostoma slightly convex, with brownish
107 border on anterior margin; hypostomal sclerites markedly truncate at inner and posterior margins, and widely shifted. Gular plate between former broad, trapezoid, not narrower apically than labial submentum. Parietals in anterior half reddish or rusty-brown, with sparse hairs in middle, and one hyaline ocellus near antennal base. Antennae short, barely protrude or even do not protrude beyond anterior margin of cephalic capsule. Ocular-antennal area completely covered from behind by rusty-brown border. Clypeus short, distinct at base, with brownish tinge. Labrum small, broadly rounded on anterior margin, with light-colored bristles along margin, brownish at base, and whitish in remaining part. Mandibles massive, broad, inner side notched, broadly rounded at apex, and with produced cultrate margin.

Pronotum rounded and narrows slightly anteriorly, with two transverse-rectangular rusty spots in anterior third, large whitish punctation, oval and longitudinally elongate, lustrous, yellow glabrous spots on sides, in anterior half of disk and laterally with rusty hairs. Pronotal shield white, leathery, with longitudinal wrinkles, angularly produced forward in middle of anterior margin, bound laterally by deep longitudinal folds, and with narrow deep median longitudinal groove. Prosternum with dense rusty hairs that are longer along sides of anterior margin (presternum). Eusternum glabrous, whitish, matte, with two glabrous
108 sclerites divided by hairy field. Thoracic legs lacking.

Abdomen with short rusty hairs on sides. Dorsal locomotory ampullae convex, divided by common median longitudinal groove, laterally with barely visible turned folds connected sometimes toward front with transverse groove; with fine shagreen sculpture and silvery tinge.



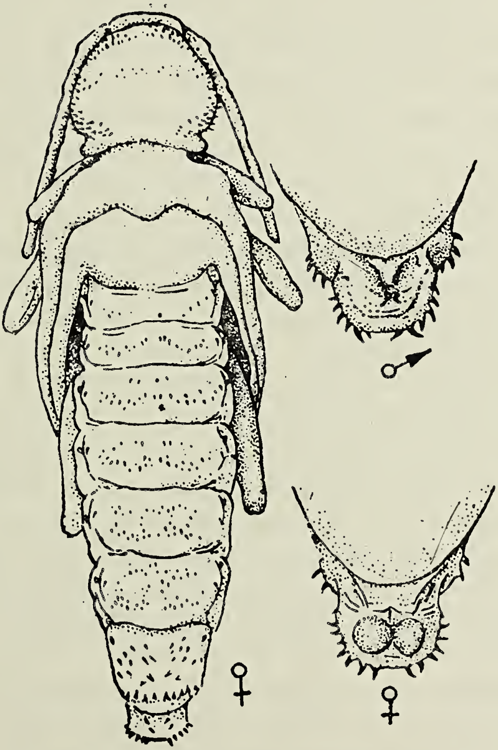
107 Figure 60. Larva of *Brachyclytus singularis* Kr.
a—right mandible; b—head and pronotum; c—abdominal
tergite with dorsal locomotory ampulla.

Ventral locomotory ampullae divided by median transverse groove, from which faint longitudinal wrinkles originate. Body length of mature larva 13 to 16 mm, width of head 2.0 to 2.5 mm.

Pupa (Figure 61): Differs well from pupa of other species of the tribe in multiplicity of spinules bordering posterior margin of abdominal tergite VII. Head short, narrows markedly ahead of antennae. Frons broad, slightly convex, and almost in same plane as vertex. Occiput broadly rounded. Antennae short, flexed to sides; apices barely reach posterior angle of metanotum.

Pronotum transverse, broadly rounded on sides, with narrow transverse groove near posterior margin, uniformly convex of disk in posterior half, slopes more smoothly toward front, with minute aristate spinules in anterior half, on sides, and in lateral part near base; glabrous at commencement of posterior slope. Mesonotum slightly convex, almost flat, with angular and broadly produced shield on posterior margin; sides with or without stray, barely perceptible bristles. Metanotum broad, broadly rounded posteriorly, with median longitudinal groove, barely perceptible transverse streaks, and stray thin short bristles.

Abdomen broadens more (female) or less (male) in region of segments III to IV, narrows slightly anteriorly and more toward tip. Abdominal tergites convex in posterior half, with narrow median longitudinal groove; sharp spinules directed backward from transverse stripe in posterior half (with 16 to 20 spinules in stripe), and transverse jumbled series in anterior half. Spinules on tergite VI constitute large field, almost occupy entire disk. Tergite VII narrows slightly toward apex, rounded on posterior margin and here appears armed with numerous large and short spinules (up to 15 to 18) bent forward and forming distinct transverse row curving slightly backward; disk with or without acute spinules bent backward and inward. Valvifers of female large, hemispherical,



107 Figure 61. Pupa of *Brachyclytus singularis* Kr.

highly contiguous. Body length 12 to 14 mm, width of abdomen 3.5 to 4.0 mm.

Material: Collected in Ussuri-Primor'e region. Adults 227, larvae 43, pupae—10 males and females, larval and pupal exuviae with beetles from pupal cells 21.

Distribution: Eastern region of Asia within confines of grape cultivation, including lower part of Amur basin, Ussuri-Primor'e region, southern Sakhalin, Kunashir; northeastern China, Korean Peninsula, Japan (Hokkaido, Honshu).

Biology: Inhabits broad-leaved forests. Ecologically associated with grape. Beetles emerge from May to July, do not visit flowers, but during this period found on branches of grape, where mating takes place. Female oviposits under peeling strips of bark, spacing single eggs some distance from each other. Predominantly found on thin branches up to 2.0 cm in diameter and very rarely thicker branches. One female can lay 24 to 72 eggs in her lifetime. Maximum number of eggs laid by 109 beetles on grape branches in second half of June. Development of eggs under laboratory conditions at 21±0.3°C continued for an average of 11.1 days, but in nature at a low temperature for about two weeks or slightly longer. Hatching of larvae starts in June, ceases at beginning of July. Mature larvae rupture chorion, bore branch, make longitudinal galleries in upper layer of wood (under bark) or in pith, and fill them with fine frass. Sometimes larvae move parallelly and their galleries fuse; as a result the wood of thin branches is so severely damaged that only a small part remains. Larvae usually make pupal cell at end of gallery. Length of pupal cell up to 17 mm, width 7.0 mm.

Pupation observed in second half of summer (mainly in August). Pupae found up to mid-September. They locate in pupal cell with head downward, toward butt end of branch. Development of pupae continues for two to three weeks, in some cases up to four weeks. Young beetles appear end of August and during September, but remain in pupal cells for hibernation. During spring (in May) they cut openings 2.0 mm × 3.0 mm to 2.5 mm × 3.5 mm and exit from pupal cell. By this time gonads are fully developed, suggesting that gonadal maturation stimulates beetles to cut exit and emerge from wood. Reproduction commences soon after emergence from wood. Four stages have been identified in change of weight of individuals during metamorphosis; preparation of larvae for pupation, pupation, formation of adults, and hibernation (diapause). For example, the weight of nine mature larvae ready for pupation was 776 mg (100%), prepupae 690.8 mg (89%), pupae 650.3 mg (83.8%) and adults before hibernation 475.5 mg (61.2%), i.e., overall weight loss during metamorphosis was 38.8%. Beetles additionally lose weight during hibernation to the extent of 13.7 to 24.6%.

Nevertheless, they retain sufficient energy for reproduction without supplementary feeding. The average weight in a population, based on records of 26 individuals was: larvae before pupation 47.0 to 100.4 mg, pupae 42.8 to 97.7 mg, and young beetles before hibernation 33.2 to 82.0 mg.

Brachyclytus singularis Kr. develops on grape. It lives on viable as well as drying branches. Long-horned beetles of the genera *Phymatodes* and *Teratoclytus* are often found together with this species on branches, constituting a common pest complex of grapes. We raised 213 adults of this species from sections of grape clusters collected in a forest infested with larvae. Not found on other plants or trees.

4. Genus *Cyrtoclytus* Ganglb.

Ganglbauer, 1882. In: Best's *Tab. Europ. Coleopt.*, vol. 10, p. 688; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 421; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 258.

Adult: Characterized by elongate, almost cylindrical (not flat) body. Head, pronotum, and ventral side of body with long erect hairs. Antennae short; apices extend only beyond first band on elytra. Scutellum triangular. Elytra with parallel sides, elongate, with yellow hairy cross-bands. Femora slightly clavate, gradually thicken in second half.

Larva: Characterized by absence of thoracic legs. Head narrowly rounded anteriorly, markedly retracted into prothorax, on sides near antennal base with one hyaline or sparsely pigmented ocellus. Labial mentum conspicuously [*C. capra* (Germ.)] or barely [*C. caproides* (Bat.)] 110 narrower than maxillary stipes. Pronotum with uniform rusty hairs on sides and ahead of shield on disk, with two rusty spots in anterior half, barely perceptible notch on anterior margin. Pronotal shield leathery, straightly truncate at anterior margin. Dorsal and ventral locomotory ampullae well developed on abdominal segments I to VII.

Pupa: Distinguished by short antennae that extend beyond meso- or metanotum. Pronotum convex, with scattered minute and aristate spinules on sides and in anterior half, large glabrous sclerite behind middle of posterior slope. Meso- and metanota smooth or with barely perceptible stray spinules visible under high magnification. Abdominal tergites with numerous large and acute spinules in posterior half directed backward, and several small spinules in anterior half (predominantly on tergites III to VI).

The genus *Cyrtoclytus* Ganglb. belongs to Eurasian fauna and only one species spread throughout most of the Palearctic. Six species are distributed in the eastern and southwestern regions of Asia. Only two species are found in northern Asia, and are ecologically associated with deciduous trees, attacking dried as well as drying trees, and often living not only on trunks but also shoots of these trees.

Type species: *Callidium capra* Germar, 1824.

KEY TO SPECIES

Adult Insects

1 (2). Elytra without rusty spot near base behind humeral tubercle, Posterior band of elytra does not broaden toward sides. Palearctic. . . . . 1. **C. capra** (Germ).

2 (1). Elytra with large rusty spot near base behind humeral tubercle. Posterior band of elytra broadens toward sides. Kunashir Island; Japan. . . . . 2. **C. caproides** (Bat.).

Larvae

1 (2). Labial mentum narrow, width 0.50 maxillary stipes. Found on many deciduous trees. . . . . 1. **C. capra** (Germ.).

2 (1). Labial mentum broad, distinctly transverse, not narrower or barely narrower than maxillary stipes. Found on maple, elm, and other deciduous trees. . . . . 2. **C. caproides** (Bat.).

Pupae

1 (2). Pronotum on posterior slope with minute paramedial spinules along posterior margin. Antennal apices of female extend beyond metanotum. 1. **C. capra** (Germ.).

2 (1). Pronotum on posterior slope with large acute paramedial spinules along posterior margin. Antennal apices of female extend only beyond mesonotum. . . . . 2. **C. caproides** (Bat.).

1. **Cyrtoclytus capra** (Germ.)

Germar, 1824, *Ins. Spec. Nov.*, p. 518 (*Callidium*). Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 421–423; Cherepanov and Cherepanova, 1975, *Zhuki-drovoseki ivovykh lesov Sibiri*, pp. 111–115.

Adult (Figure 62): Body elongate, almost cylindrical. Head depressed on vertex, with large dense punctation, even on parts of frons with deep punctures, thin, long, light-colored erect hairs, laterally with dense 111 adherent yellowish hairs near eyes in form of two longitudinal stripes, with short adherent yellow hairs near occiput forming narrow transverse yellow stripe. Eyes convex, with very minute smooth facets, narrowly truncate on inner side. Antennal apices barely extend beyond first quarter of elytra; 8th to 10th segments short, only 1.5 to 2.0 times longer than wide.

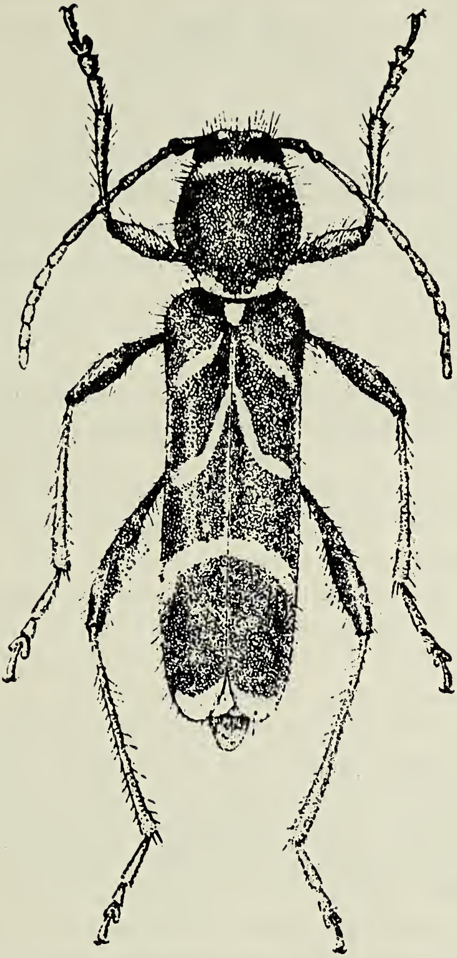


Figure 62. *Cyrtoclytus capra* (Germ.).

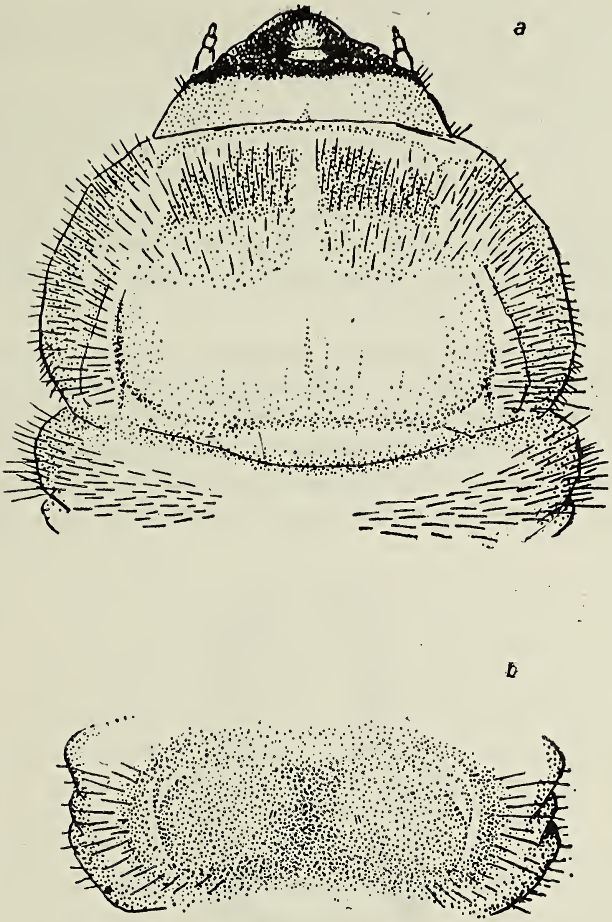
Pronotum laterally rounded, narrows less posteriorly; disk tubercular, convex, with large deep wrinkles, sides with fine punctation, entire surface with long erect rusty hairs, anterior margin with narrow continuous and posterior margin laterally with broader, dotlike, transverse, yellow hairy stripe. Scutellum almost triangular, narrowly rounded or pointed anteriorly, with adherent yellow hairs.

Elytra elongate, with parallel sides, broadly rounded throughout entire apical section, with smoothly rounded humeri, narrow longitudinal depression on scutellum behind suture, large wrinkles in anterior half, fine dense punctation in posterior half, with sparse thin erect hairy crossbands (anterior band very narrow, originates obliquely from scutellum backward and toward sides; middle band denser and extends from sides beyond middle toward front along suture up to anterior quarter of elytra; posterior band dense and extends from suture toward lateral margin, curving forward slightly), with yellow apical hairy border, and short yellow stripe on sides (f. *typica*). Sometimes lateral stripes connected with middle band (ab. *vavrai* Roub.) or anterior band absent (ab. *inbasalis* Plav.). Femora moderately clavate, hind femora significantly short of reaching elytral apex. Hind tarsi 0.66 length of tibiae, 1st segment not shorter than remaining segments together. Body ventrally with short semiadherent hairs, metasternum on posterior margin with narrow, and abdominal sternites I to IV with broader dense yellowish hairy border. Body black. Antennae and tibiae rusty. Femora black. Body length 8.0 to 19.0 mm.

Egg: White, elongate, rounded on poles, narrows more toward posterior pole. Chorion smooth, lustrous. Length 1.5 to 2.0 mm, width 0.6 to 0.8 mm.

Larva (Figure 63): Characterized by absence of thoracic legs and presence of dense rusty hairy cover on prosternum. Head narrows slightly toward front. Epistoma notably convex, lustrous, sides not demarcated from parietals, frontal sutures not visible, anterior margin with smooth
112 brownish border, slightly depressed at apex and here with reduced median suture; very dense short hairs before middle form transverse row; and pair of contiguous short bristles along sides of anterior margin. Hypostoma slightly convex, almost flat, narrowly rounded at inner angles of sclerites or elongate, slightly notched at anterior margin near these angles, and with faint transverse wrinkles in anterior half. Gular plate narrow in anterior half, almost with parallel sides, with brownish tinge. Parietals with short thin rusty hairs in anterior half, and brownish-rust border along anterior margin that covers antennal base. Convex, hyaline, sometimes sparsely pigmented ocellus located slightly ventral to antennae. Clypeus short with faint brownish tinge. Labrium convex, narrows toward apex, narrowly rounded at apex, and with thin piliform bristles along margins. Mandibles broadly rounded at apex, flattened on outer side near base or broadly depressed. Inner masticatory lobes of maxillae whitish, lustrous at apex, with stray bristles, and significantly shorter than palps. Labial mentum transverse, with rusty bristles form-
113 ing small group on each side. Submentum with pair of long bristles in middle and divided into three longitudinal lobes.

Pronotum slopes toward head, barely narrowly rounded anteriorly, with two broad yellowish-rust transverse spots in anterior half divided by narrow white clearance on disk, laterally with fairly elongate yellow spots, anterior half before scutellum and sides with uniform rusty hairs. Pronotal shield leathery, white, convex, bound laterally by deep longitudinal grooves, with almost straightly truncate anterior margin. Pre-



112 Figure 63. Larva of *Cyrtoclytus capra* (Germ.). a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

sternum with dense uniform rusty hairs; eusternum white, matte, without hairs, glabrous, lustrous, with two sclerites divided toward front by broad hairy field. Thoracic legs lacking.

Abdomen laterally with short thin hairs. Dorsal locomotory ampullae convex, shagreen, with broad median longitudinal groove, and bound laterally by curved longitudinal folds. Ventral locomotory ampullae transversely elongate, more so on sides, shagreen, with fairly reduced median transverse groove. Body length of mature larvae 20 to 25 mm, width of head 2.5 to 3.0 mm.

Pupa (Figure 64): Head moderately bent downward, narrows toward front, with barely perceptible flat longitudinal depression between antennae, scattered fine bristles laterally ahead of antennae, three spinelike bristles behind antennae forming transverse row, and glabrous, broadly rounded occiput. Antennae not very long; apices extend beyond middle of midfemora and flexed here by sides of elytra.

Pronotum convex, with narrow basal transverse groove, smoothly rounded on sides, with scattered fine bristles in anterior half of disk, laterally, and in posterior half before posterior angles; disk behind middle, glabrous, lustrous, and elevated more. Mesonotum smooth in middle, longitudinally convex, with triangularly produced shield toward backside, and one or two barely perceptible acute spinules along side forming triangle.

Abdomen moderately elongate, segment V narrows toward tip. Abdominal tergites convex, with large acute or not very large and numerous spinules in posterior half directed backward (spinules small and few only on tergite I), without spinules or with stray spinules in anterior half forming transverse row. Tergite VII narrows toward apex, broadly or narrowly rounded posteriorly, disk convex, with four to six long

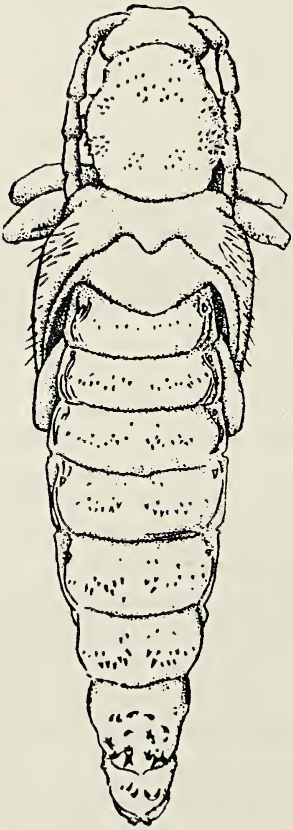


Figure 64. Pupa of *Cyrtoclytus capra* (Germ.).

sharp mono- or biapical spinules on posterior margin bent forward, pair of spinules behind middle bent inward; and minute spinules forming narrow transverse stripe in anterior half. Tergite VIII short, with four to five large or not very large spinules on posterior margin bent forward. Valvifers of female hemispherical, highly contiguous, with round tubercle at apex. Body length up to 15 mm, width of abdomen up to 3.5 mm.

Material: Collected in Ural region, Altai, Ob' and Yenisey forests, Tuva, Baikal, Trans-Baikal, and Ussuri-Primor'e region. Adults 1,480, larvae 72, pupae—two females, larval exuviae with beetles from pupal cells eight.

Distribution: Occupies forest zone of Europe and Central Asia. Found north up to forest zone, south up to Kazakhstan, Tuva; northern Mongolia, northern China, Korean Peninsula, and Japan.

114 *Biology*: Inhabits deciduous and mixed plantations. Ecologically associated with many deciduous trees. Rises in mountains up to 1,000 m. Beetles emerge from first half of June to mid-August. For example, 410 beetles were caught during the season in Altai: 28.7% in June, 68.6% in July, and 2.7% in August; 870 beetles were collected from linden forests in Salair: 18.7% in June, 71.2% in July, and 10.1% in August. The same pattern of beetle emergence was also observed in other regions. On emergence beetles fly to flowers of Asteraceae, Rosaceae, Umbelliferae, and other plants, feed, then migrate to drying or desiccated trees, mate and oviposit. One female can lay 46 eggs in her lifetime. Ovaries of one female collected from flowers contained 24 eggs, of another 34 eggs. Female lays eggs under scales or in crevices of bark, inhabiting many deciduous trees. Under experimental conditions many types of trees were chopped, but mountain ash, linden, and birch were preferred by the beetles while pine and fir were totally neglected (Cherepanov and Cherepanova, 1975).

Egg development from oviposition up to larval emergence continues for about three weeks. For example, in Salair 143 eggs were kept in an observation chamber under forest cover. The first larvae hatched after 16 days, and the last larvae after 28 days from oviposition, with an average of 21.2 days. Atmospheric temperature during this period fluctuated from 10.5 to 28.0°C, average 18.5°C. Larvae hatched from second half of July to mid-September, with the maximum (more than 80%) hatching from eggs in August. Fully formed larvae rupture chorion, bore bark, reach its lower margin, make galleries transverse to trunk, impressed on alburnum, and fill them with fine frass. After first hibernation, larvae move deeper into wood and longitudinal straight or meandering, sometimes transverse galleries at depth of 1.5 to 4.0 cm. After second hibernation, larvae make pupal cell in upper layer of wood, usually longitudinal, rarely transverse or oblique to trunk length, turn with head in direction opposite to entrance, and pupate. Length of pupal cell 19 to 25 mm, width 7.0 to 8.0 mm. Layer of wood up to 2.0 mm thick remains between bark and anterior margin of pupal cell. Width of galleries before pupal cell up to 8.0 mm.

Pupation begins in second half of May and ends in June. Beetles emerge from pupae after two to thre weeks. Young beetle cuts round opening (3.5 to 5.0 mm in diameter) on surface of branch and exits from pupal cell through it. Cycle of development completed in two years. Emergence of beetles from wood commences in June and terminates in first half of July (Table 6).

115 **Table 6. Periods of development of *Cyrtoclytus capra* (Germ.)**

Year of development	April	May	June	July	August	September	October
1st	L	LP	LPA	AEL	AEL	EL	L
2nd	L	L	L	L	L	L	L
3rd	L	LP	LPA	AEL	AEL	EL	L

Changes in weight during the period of metamorphosis are illustrated in a single individual: weight of larva ready for pupation 96 mg (100%), pupa developed from it 91 mg (94.8%), and beetle from pupa 63 mg (65.6%). Individuals in a population vary markedly in weight. For example, records of 12 specimens revealed: weight of larvae before pupation from 48 to 124 mg, pupae 43.5 to 113.0 mg, and young beetles before emergence from pupal cell 35.8 to 93.0 mg.

Cyrtoclytus capra (Germ.) develops on trunks and shoots of drying and desiccated deciduous trees. We obtained 158 beetles from larvae collected from wood in a forest in the Far East: 48 from maple, 22 alder, 14 hornbeam, 10 each oak and elm, eight willow, seven choke-cherry, six each ash, pear, and spindle tree, five birch, three each Manchurian nut and common (mountain) ash, two hawthorn, and one each Amur grape, guelder rose, linden, aralia, filbert, *Micromeles alnifolia*, *Chosenia*, and apple. While inspecting forests an additional 72 larvae, two pupae, 115 and 13 beetles were extracted from wood of various trees: 34 from mountain ash, 12 alder, four willow, 11 choke-cherry, one each aspen and others. In Salair this species was found on mountain ash, linden, and birch. Not found on conifers.

2. **Cyrtoclytus caproides** (Bat.)

Bates, 1873, *Ann. Mag. Nat. Hist.*, 12, 4, 200 (*Clytus*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 423–425; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 80; Krovolutskaya, 1973, *Entomofauna Kuril'skikh ostrovov*, p. 105.

Adult (Figure 65): Differs from the closely related species *C. capra* (Germ.) in presence of rusty spot on elytra near humeri, rusty or slightly darkned femora, and very broad band in posterior half of elytra. Head with dense punctation, devoid of very long erect tubercular hairs, with narrow longitudinal groove ahead of frons; dense adherent yellowish hairs along sides form two parallel longitudinal stripes. Antennae short, thick; apices barely reach or do not reach beyond first quarter of elytra; 8th to 10th segments 1.5 times longer than wide.

Pronotum narrows slightly more posteriorly than anteriorly, disk uniformly rounded hemispherically, with very dense deep uniform punc-

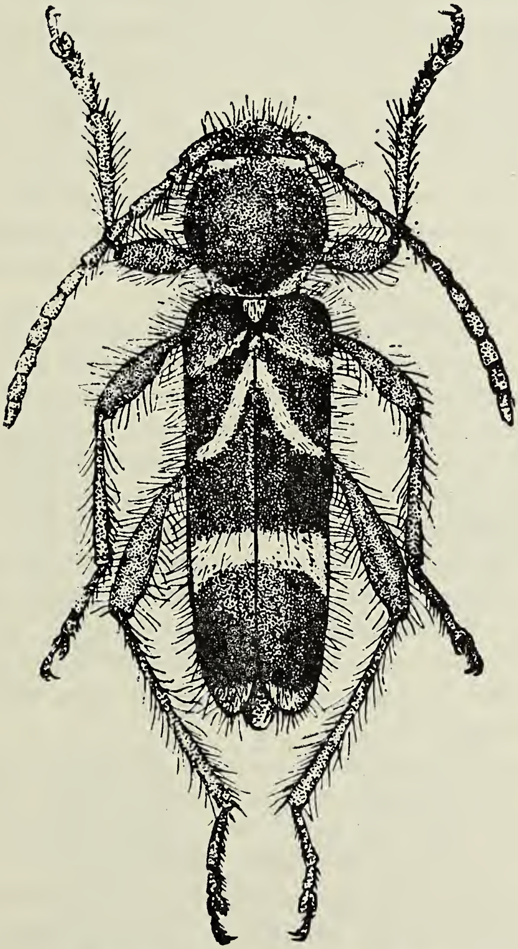


Figure 65. *Cyrtoclytus caproides* (Bat.).

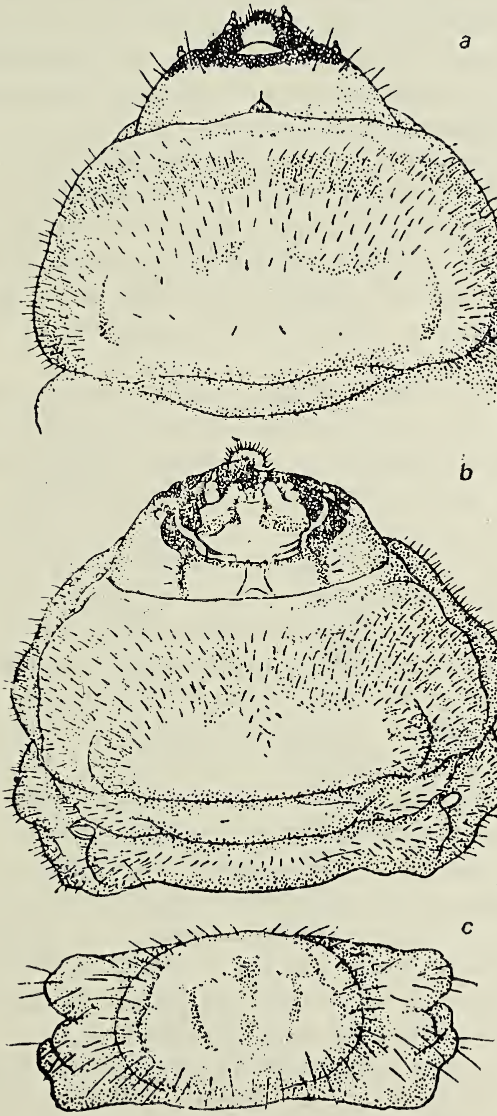
tation, brownish thin erect hairs, and transverse yellow hairy border laterally on anterior and posterior margins. Borders sometimes well developed, sometimes absent. Scutellum small, triangular, with dense yellowish hairs anteriorly.

Elytra elongate, parallel, or narrow slightly toward apex, entirely rounded and broad at apex, suture behind scutellum very narrowly de-
116 pressed longitudinally, along sides in anterior half (especially behind humeri) with large, and in posterior half very small punctation, with fine adherent and long erect light-colored hairs, and three yellowish hairy crossbands. Anterior band whitish, sparsely pubescent, behind scutellum extends from suture toward sides behind humeral tubercle; median yellowish band densely pubescent, extends from suture in anterior third toward sides obliquely backward up to middle of elytra; posterior band broader, located in posterior half, and extends from suture toward sides where it broadens slightly. Elytral apex with more or less yellowish hairy border. Legs thin, hairy; hind femora with short thin claw. First segment of hind tarsus longer than all successive segments together. Body ventrally with semiadherent brownish hairs. Abdominal sternites I to III with yellow hairy border on posterior margin. Body black. Elytra near base behind humeri with transverse rusty spot; spot often enlarges and broadens before white hairy stripe almost up to scutellum, covering humeral tubercle. Antennae and legs entirely rusty, sometimes only forefemora darkened. Body length 9.0 to 15.0 mm.

Egg: Quite elongate, narrows gradually toward posterior pole and narrowly rounded, at anterior pole broadly rounded. Chorion smooth, without perceptible sculpture. Length 1.8 mm, width 0.5 to 0.6 mm.

Larva (Figure 66): Very similar to larva of *C. capra* (Germ.). Differs in broader labial mentum. Head markedly retracted into prothorax, and narrowly rounded toward front. Epistoma smooth, slightly convex, with smooth lustrous brownish border along anterior margin, behind which three pairs of minute hairs (lateral and median) form transverse row; laterally fused with parietals; frontal sutures not visible. Median suture in form of reduced brownish line, visible only at apex. Hypostoma flat, with parallel sides, or narrows slightly toward front, with narrow chocolate-brown border on anterior margin. Gular plate broad, trapezoid, with brownish tinge.

Parietals smoothly rounded, with broad border on anterior margin that covers ocellar antennal area posteriorly; medially with sparse uneven rusty hairs. Antennae barely extend beyond anterior margin of cephalic capsule; 2nd segment slightly thicker than 3rd. Ocellus near antennal base small and sparsely pigmented. Clypeus short, broadens markedly at base, brownish. Labrum white, convex, transverse, broadly rounded, and with short light-colored bristles in anterior half. Mandibles smoothly convex and lustrous on outer side, with narrow transverse groove near base. Inner masticatory lobes of maxillae notably truncate at apex, whitish, with thin bristles forming crown that is barely shorter than maxillary palps. Labial mentum distinctly transverse, not narrower or barely narrower than maxillary stipes, with long rusty bristles on sides forming transverse row.



117 Figure 66. Larva of *Cyrtoclytus caproides* (Bat.).
a—head and pronotum; b—head and prosternum; c—abdominal tergite with dorsal locomotory ampulla.

Pronotum narrows slightly toward front, broadly rounded at anterior margin, with uniform rusty hairs laterally and on disk before shield, pair of transverse yellowish-rust spots in anterior third, longitudinally elongate oval spot on sides, which is sometimes faintly yellow and lustrous. Pronotal shield white, convex posteriorly and matte silver here, slopes flatly toward front, bound laterally by longitudinal deep grooves, with pair of widely separated short bristles near base of disk. Anterior margin of prosternum glabrous, white, matte. Presternum with uniform, 117 comparatively dense rusty hairs along sides and on disk. Eusternum glabrous, leathery, its anterior margin divided by backward protruding hairy field, or without it.

Abdomen moderatly elongate, with short thin rusty or light-colored hairs on sides and posterior angles of dorsal locomotory ampullae. Dorsal locomotory ampullae convex, with narrow median longitudinal groove, matte silver, shagreen. Ventral locomotory ampullae transversely elongate, with smooth shallow median longitudinal depression, and matte silver appearance. Length of mature larvae up to 22 mm, width of head up to 2.8 mm.

Pupa (Figure 67): Body elongate. Head short, slightly convex between antennae, flat on vertex, with isolated short spinules along sides of frons and behind antennae. Antennal apices in female extend beyond mesonotum [in female *Cyrtoclytus capra* (Germ.) they reach beyond metanotum], and in male beyond posterior margin of metanotum.

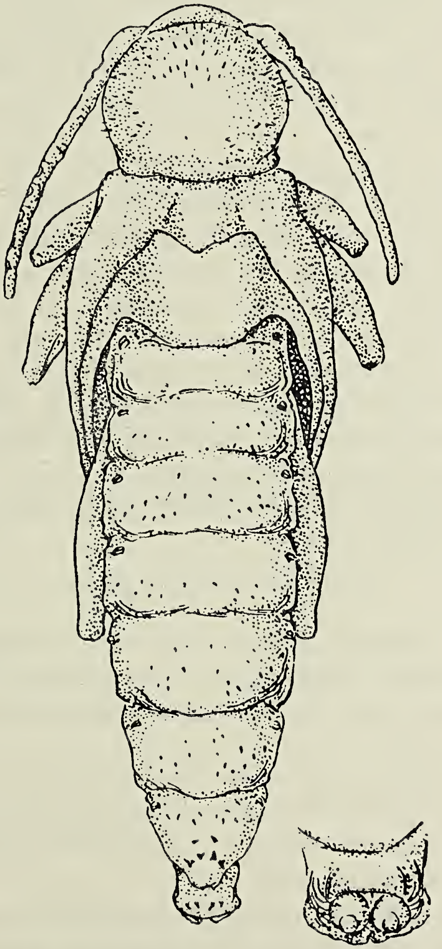
118 Pronotum uniformly but conspicuously convex, slightly rounded laterally, with narrow transverse and barely expressed grooves near base, laterally with numerous scattered spinules near posterior margin, and with large, slightly convex glabrous platform at commencement of posterior slope behind middle. Mesonotum with or without one spinule on sides of anterior half, saddle shaped, slightly depressed behind middle, and posteriorly with raised scutellum curved apically. Metanotum slightly convex, notably flattened on sides, with median longitudinal groove and laterally on disk with three minute acicular spinules.

Abdomen elongate, narrows slightly from segment IV toward tip. Abdominal tergites convex, with barely perceptible median longitudinal groove; posterior half with spinules bent backward and forming transverse row or stripe; of these, one pair of larger spinules along sides of longitudinal groove conspicuous. Anterior half of tergite without, or with few spinules forming jumbled transverse row.

Tergite VII convex, sides (dropping abruptly) with longitudinal pattern, narrows posteriorly, rounded dorsally, with four to six large sharp spinules on posterior margin that are either erect or slightly bent forward, and form posterior transverse row; smaller spinules behind middle form median row; before middle spinules constitute anterior transverse row. Tergite VIII transverse, with fine pattern on sides; posterior margin with four spinules forming transverse row, that are either bent inward toward front or erect. Apices of hind femora extend beyond middle of tergite V. Valvifers of female large, hemispherical, compact, with round spherical tubercle at apex. Body length 16 to 18 mm, width of abdomen 3.0 to 3.5 mm.

Material: Collected from Kunashir Island. Adults seven, larvae 32, pupae—one male and two females, larval exuviae with beetles obtained from pupal cell four.

Distribution: Insular species. Lives on Sakhalin, Kunashir Island, and Islands of Japan. Reports exist of its sporadic occurrence in northeast China and the Korean Peninsula (?).



117 Figure 67. Pupa of *Cyrtoclytus caproides* (Bat.), female.

Biology: Inhabits broad-leaved forests of islands of the Far East. Beetles emerge from end of July to beginning of September. After mating, female oviposits in bark crevices. Larvae live in trunks and thick shoots of dead trees, make longitudinal, sometimes meandering galleries 8.0 to 10.0 mm wide in wood at depth of 1.5 to 4.0 cm, and fill them compactly with fine white frass. Larva then makes pupal cell at end of gallery longitudinal to trunk in upper layer of wood. Length of pupal cell 2.0 to 3.5 cm, width 7.3 to 10.0 mm. A layer of wood 2.0 to 5.0 mm remains between pupal cell and bark. Larva pupates in pupal cell with head pointing in opposite direction to entrance.

Pupation of larvae recorded in June and July on Kunashir Island. Development of pupae varies and may continue for a long time. For example, a beetle emerged on July 18 from a pupa found July 1st, while from larvae that pupated on June 25 beetles appeared around July 31. Temperature during this period ranged from 7.0°C in the morning to 26°C later in the day, with an average of 16.1°C. Young beetles were found in pupal cells from end of June to early August. Large openings (3.0 to 5.0 mm in diameter) are cut on surface of branches and adults fly out through them. Since gonads are mature by this time, beetles are capa-
119 ble of reproduction soon after emergence from pupal cells. Ovaries of one female dissected seven days after emergence from pupal cell contained 42 mature eggs. Generation completed in two years. This is confirmed by the fact that middle-aged larvae are found in July in wood of trees infested by them, and pupae and adults remain for a second hibernation. Weight of prepupae (based on records of six individuals) 90 to 162 mg, pupae developed from them 36 to 148 mg, and young beetles before emergence from wood 30 to 119 mg. One mature larva prior to preparation for pupation weighed 256 mg.

Cyrtoclytus caproides (Bat.) is found on maple, elm, and birch. Found more often on first two trees.

5. Genus *Epiclytus* Gress.

Gressit, 1935, *Kontyu*, vol. 9, pp. 173–174; = *Eoclytus* Plav., Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 425–426; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 257; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 81.

Adult: Small, with convex and slightly notched eyes, parallel sides, sloping abruptly in posterior quarter, elytral apices completely rounded, with long slender antennae, and very long legs (hind femora conspicuously extend beyond elytral apex).

Larva: Characterized by three pigmented ocelli on each side of head forming transverse band starting on ventral side from antennae. Thoracic legs developed, small. Pronotal shield leathery, longitudinally rugose.

Locomotory ampullae developed on abdominal segments I to VII, matte, on dorsal side with two and ventral side one transverse groove.

Pupa: Head relatively short and broad. Antennae bent in distal third, apices directed forwad on ventral side, and flexed here to elytra near hind tibiae. Pronotum uniformly convex, with stray minute bristles. Abdomen with minute sclerotized spinules on dorsal side forming individual clusters. Apices of hind femora extend beyond abdominal tergite VI. Valvifers of female with narrow gap between.

The genus *Epiclytus* Gress. (= *Eoclytus* Plav.) comprises just three species, found locally in eastern Asia, including Japan [*E. yokoyamai* (Kano)], southern China (*E. ruficaudus* Gress.), and Ussuri-Primor'e region [*E. ussuricus* (Pic)].

Type species: *Clytus yokoyamai* Kano, 1933.

1. **Epiclytus ussuricus** (Pic)

Pic, 1933, *Echange*, 49, 453, 10 (*Clytus*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 426–427 (*Eoclytus*); Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 258.

Adult (Figure 68): Body moderately elongate. Frons flat, broad, with parallel sides, rounded margin near eyes, barely raised margins in anterior half, with dense fine punctation and very short adherent grayish hairs, narrow median longitudinal groove in form of line, or without it, and raised margin near antennal base. Vertex sharply depressed, with dense punctation. Eyes very convex, rounded, minutely faceted, and on inner side insignificantly notched. Antennae long, slender, slightly short of reaching elytral apex (female) or even extend beyond it (male), and elongated spinelike at apex commencing for 5th segment; 3rd segment very slender, the longest, notably longer than 1st.

Pronotum almost hemispherically convex, its length slightly more or not more than width, with dense distinct punctation in middle, erect tuber-
120 cular hairs, laterally rounded with curved anterior and posterior margins. Scutellum small, broadly rounded posteriorly, with fine punctation. Elytra convex, with parallel sides, entirely broadly rounded at apex, slopes abruptly here, depressed behind humeri, with prominent humeral tubercle, very dense punctation, and adherent hairs; anterior half behind humeri with narrow oblique white hairy stripe, before or almost at middle with sparse broad grayish hairy crossband extending forward along suture, with grayish hairy field covering entire posterior slope. Legs long and slender; hind femora slender, nonclavate, extend far beyond elytral apex. Hind tarsi slender; 1st segment much larger than two successive segments together. Episterna of meso- and metathorax with dense, compactly adherent hairs in posterior half; metasternum with dense, medially interrupted, white hairy border along posterior margin. Abdomen

lustrous, with sparse rusty semiadherent hairs. Body, antennae, elytra, and legs black; tarsi usually with rusty tinge, sometimes legs rusty-brown, antennae brownish. Body length 6.0 to 9.0 mm.

Egg: White, elongate, narrowly rounded at posterior pole, broadly rounded at anterior pole, narrows more toward posterior pole. Chorion

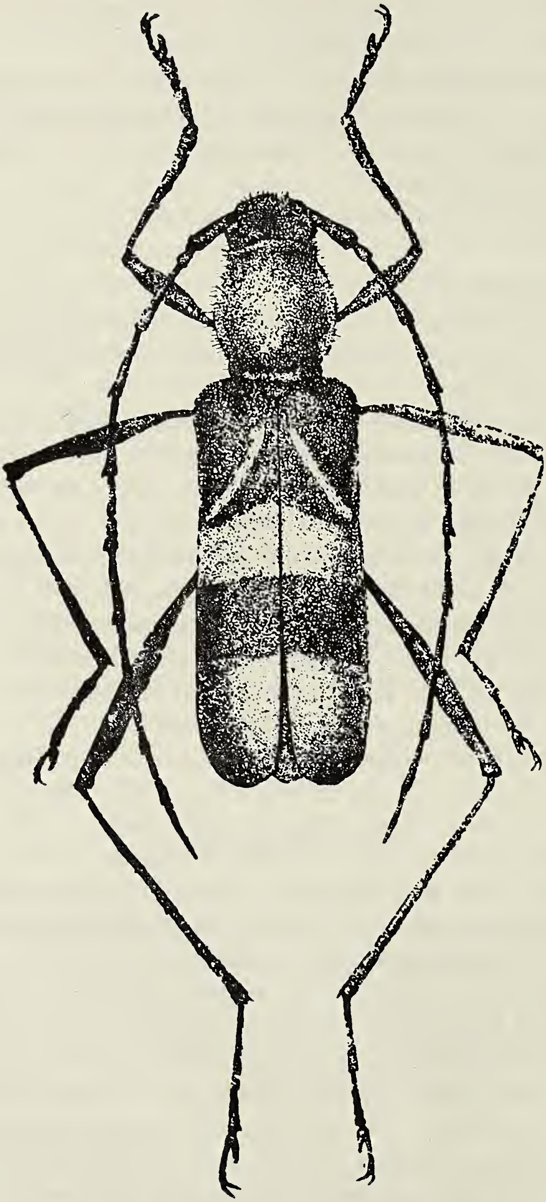
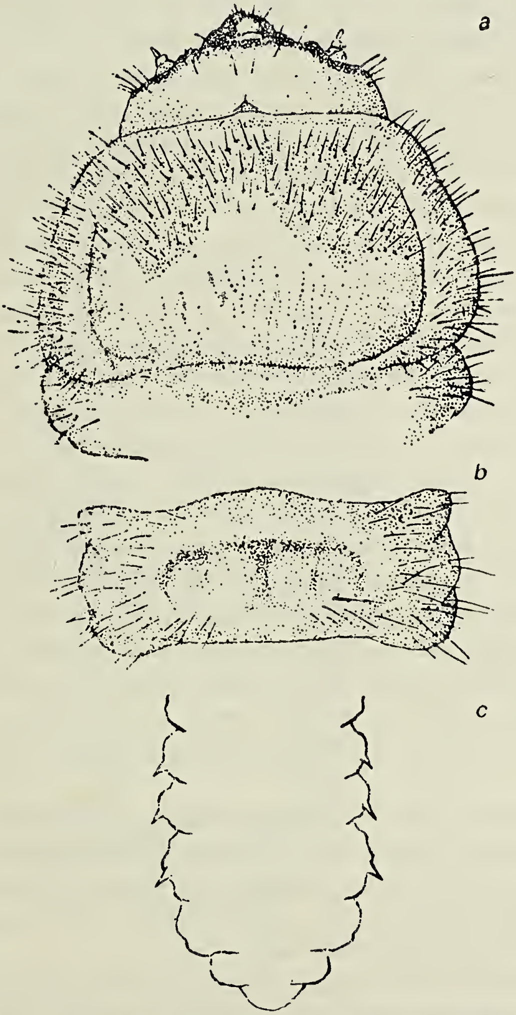


Figure 68. *Epiclytus ussuricus* (Pic), male.

smooth, lustrous, without perceptible sculpture. Length 1.1 mm, width 0.5 mm.

Larva (Figure 69): Characterized by presence of pigmented ocelli on sides of head, presence of thoracic legs, and other characters. Head markedly retracted into prothorax. Epistoma slightly convex, almost flat, without distinct sutures in middle and on sides, fused with parietals, with rusty-brown border on anterior margin. Hypostoma distinctly narrows toward front, sides with straight sutures, inner angles of sclerites sharp and pro-



121 Figure 69. Larva of *Epiclytus ussuricus* (Pic).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—abdominal segments V to VII (with spinules) of II-instar larva.

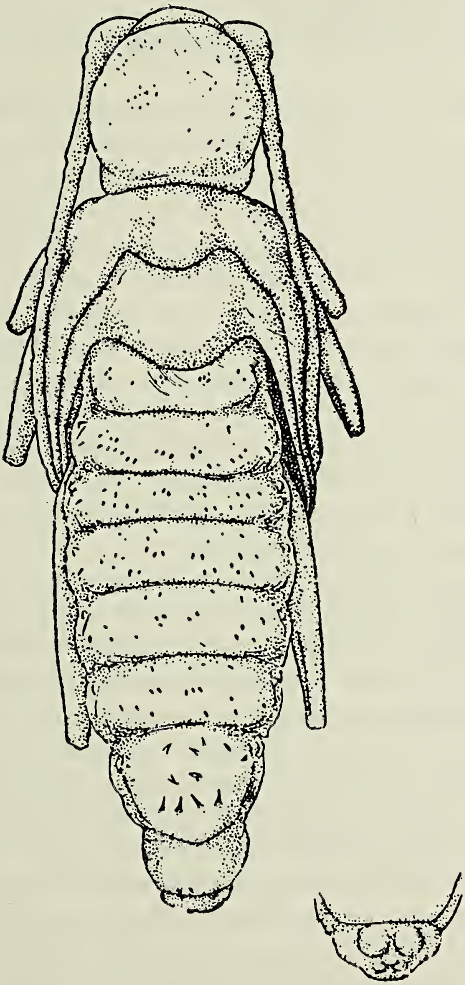
121 duced, with narrow light rusty border. Parietals with rusty border on anterior margin that does not cover ocellar-antennal area from behind, and with thin hairs before middle. Antennae long, comparatively slender, conspicuously protrude beyond anterior margin of cephalic capsule. Three pigmented and compact ocelli ventral to antennal base form transverse stripe. Clypeus short, translucent, lustrous, broadens at base. Labrum convex, whitish, with light-colored piliform bristles along margin. Mandibles narrow toward apex, and here with rounded cultrate margin, narrowly notched on inner side. Labial mentum with almost parallel sides, narrows slightly toward apex, oblong, with long piliform bristles behind middle forming transverse row or stripe.

Pronotum narrows toward front, with two transverse rusty spots in anterior third, divided by narrow space, laterally with longtudinally elongate lustrous rusty spot, with rusty light-colored hairs before shield and on sides combed toward sides in front, and with smooth median longitudinal
122 stripe. Pronotal shield flat, slightly convex only at base, bound laterally by deep straight longtudinal grooves. Anterior margin leathery and transversely truncate, with longitudinal streaklike wrinkles. Anterior margin of prosternum glabrous. Presternum with thin rusty hairs, anterior half with long, laterally bent hairs. Eusternum glabrous, leathery, not demarcated laterally, merges into general surface of pronotum. Thoracic legs short, small, slightly sclerotized at apex, with barely perceptible claw. Abdomen laterally with short and not very dense light-colored hairs. Dorsal locomotory ampullae leathery, shagreen, divided by common channel-like median longitudinal groove, and laterally with longitudinal deep lateral fold from which two short transverse grooves originate inward—one on anterior margin, the other on posterior margin. Sometimes these grooves are faint or completely absent. Ventral locomotory ampullae leathery, disk with deep transverse groove, and wrinkles originating obliquely, or without them. Body length of mature larvae up to 13 mm, width of head 1.3 mm. In I-instar larvae spinules present on sides of segments V to VIII and directed backward; these spinules disappear after molt.

Pupa (Figure 70): Body moderately elongate. Head short, broad, produced near antennal base, with median longitudinal groove, lustrous on frons, with coarse transverse wrinkles, and broadly rounded on occiput. Antennae tightly flexed to sides, apices turn forward on ventral side and here adjoin elytra behind midtibiae.

Pronotum uniformly convex on sides, broadly rounded, with narrow transverse groove posteriorly, slightly bent posterior angles, laterally in anterior half and before posterior angles on posterior slope with sparse short bristles, and with alveolar flat notch along sides. Mesonotum distinctly saddle shaped, depressed, with scutellum produced and raised dorsally. Metanotum broad, moderately convex anteriorly, with median longitudinal groove, insignificantly and broadly depressed near base, with stray minute bristles on sides.

Abdomen broadens notably in region of segments III to IV, narrows slightly toward anterior margin, more toward posterior. Abdominal tergites convex, with narrow median longitudinal groove alongside which sharp minute spinules form groups; one medial group of three spinules from each side located on common produced leathery base near longitudinal groove, and one lateral group of four to eight spinules forms transversely elongate stripe. Anterior margin of tergites IV to VI with additional fine spinules forming transverse row. Tergite VII transverse,



121 Figure 70. Pupa of *Epiclytus ussuricus* (Pic), female.

almost rectangular, with four long large sharp spinules on posterior margin bent forward; two slightly sclerotized incurved spinules toward front almost medial; anterior half with four symmetrical spinules forming transverse row. Abdominal tergite VIII small, broadly rounded posteriorly, with two to four sharp and thin spinules on posterior margin. Valvifers of female large, hemispherical, almost do not touch each other, with narrow gap between them. Hind femora flexed to sides; apices extend beyond abdominal tergite VI. Body length up to 10 mm, width of abdomen 2.0 mm.

Material: Collected in forest of Ussuri-Primor'e region. Adults 19, larvae eight, pupae—five (males and females), larval and pupal exuviae from pupal cells with beetles seven. Series of larvae obtained from eggs laid by beetles in the laboratory.

Distribution: Ussuri-Primor'e region; often found in forests of the Komarovka River basin.

123 *Biology*: Inhabits broad-leaved forests. Found sporadically, comparatively rarely. Adult beetles fly from second half of June to August, sighted on infested trees. Females oviposit on thin branches (6.0 to 15.0 mm in diameter) of drying or recently dried oak and maple trees. At 13 to 26°C (average 20.3°C) larvae emerge from eggs after 3.0 to 4.5 weeks, average 26.8 days. We kept 35 eggs under observation. Mature larvae bore bark, make longitudinal galleries underneath it, usually from top toward base, deeply impressed on wood, and fill them compactly with frass. Length of gallery leaving impression on wood 20.5 to 37.0 cm, width 5.0 to 6.0 mm. Larvae bore wood before or after second hibernation, and here make longitudinal galleries with pupal cell at end longitudinal to branch. Layer of wood up to 1.0 mm thick remains between pupal cell and bark. Length of pupal cell 21 to 28 mm, width up to 5.0 mm. Larvae pupate with head downward.

Pupation commences in May and terminates in June. At room temperature pupae develop for about three weeks. In the laboratory an adult emerged on December 21 from a pupa formed on the 2nd. Mature beetles make oval openings (2.0 × 2.5 mm in diameter) on surface of branches and exit through them on emergence from pupal cell, and immediately start to reproduce. Ovaries of one female dissected two days after emergence from wood contained 18 fully mature eggs. Weight of larvae before pupation (11 specimens weighed) 23 to 91 mg, pupae 20.2 to 83.0 mg, and beetles immediately after emergence from wood 16 to 66 mg.

Epiclytus ussuricus (Pic) damages drying and recently dried branches of still standing oak and maple trees. One oak branch 9.0 mm in diameter and 35 cm long contained two beetles and one larvae. Beetles developed from larvae collected from these trees. Not found on other trees.

6. Genus *Plagionotus* Muls.

Mulsant, 1842, *Col. France Long.*, p. 1; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 428–430; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 262; Mamaev and Danilevskii, 1975, *Lichinki zhukov-drovosekov*, pp. 210–211.

Adult: Characterized by antennae comparatively thick, and 5th to 10th segments with produced spinelike apical processes. Pronotum transverse, laterally rounded, on disk with fine simple punctation. Elytra broad at humeri (*P. christophi* Kr., *P. pulcher* Bless.), or narrow and elongate [*P. floralis* (Pall.)], with transverse hairy bands. Scutellum with short brownish hairs not forming continuous cover [*P. detritus* (L.), *P. christophi* Kr., *P. pulcher* Bless.], or dense hairs forming continuous coat [*P. arcuatus* (L.), *P. floralis* (Pall.)]. Hind femora short, do not reach elytral apex.

Egg: White elongate, lustrous [*P. detritus* (L.), *P. pulcher* Bless.], or with greenish tinge, matte [*P. floralis* (Pall.)].

Larva: Mature larva distinguished by thick massive body and presence of three convex hyaline or pigmented ocelli near antennal base. Pronotum with two transversely elongate yellow or rusty spots in anterior third, with [*P. pulcher* Bless., *P. arcuatus* (L.)] or without [*P. floralis* (Pall.)] notch on anterior margin. Pronotal shield leathery, with longitudinal
124 wrinkles or minute longitudinal streaks [*P. detritus* (L.), *P. pulcher* Bless.] or matte, with fine sculpture, without longitudinal streaks [*P. floralis* (Pall.)]. Abdomen laterally with dense rusty [*P. christophi* Kr., *P. arcuatus* (L.)] or comparatively sparse and light-colored [*P. floralis* (Pall.)] hairs. Thoracic legs short, small, with barely perceptible and slightly sclerotized [*P. floralis* (Pall.)] or dark brown and completely sclerotized [*P. arcuatus* (L.)] claw. Locomotory ampullae well developed on abdominal segments I to VII, matte, with fine sculpture.

Pupa: Body stocky [*P. detritus* (L.), *P. pulcher* Bless.] or elongate, comparatively narrow [*P. floralis* (Pall.)]. Pronotum transverse, laterally rounded, with narrow transverse groove at base, with large spinules in anterior third and on sides, on disk with fine spinules medially, forming crossband [*P. arcuatus* (L.), *P. floralis* (Pall.)] or with scattered spinules in anterior half and laterally not forming distinct crossband medially on disk [*P. detritus* (L.)]. Abdominal tergites with spines. Tergite VII with four to seven large spines bent forward forming transverse row on posterior margin, with two spinules behind and two before middle bent inward [*P. detritus* (L.), *P. pulcher* Bless.], or with numerous short spinules forming large group in anterior half and crossband in posterior half [*P. floralis* (Pall.)]. Tergite VIII with four to eight spinules, predominantly on posterior margin [*P. christophi* Kr., *P. arcuatus* (L.)] or entirely covered with spinules [*P. floralis* (Pall.)].

Plagionotus detritus (L.), *P. christophi* Kr., and other species are ecologically associated with deciduous trees, predominantly oak. Larvae live in and under bark. Only *P. floralis* (Pall.) develops on herbaceous plants, historically forming a unique branch in the composition of this genus.

Eight species of the genus *Plagionotus* Muls. have been recorded in USSR fauna. Of these, five live in northern Asia. Two of them [*P. detritus* (L.), *P. arcuatus* (L.)] from the west are found only in forests of the southern Urals, one species [*P. floralis* (Pall.)] spreads east up to Altai, and two (*P. christophi* Kr., *P. pulcher* Bless.) are found in the eastern region. The first two species [*P. detritus* (L.) and *P. arcuatus* (L.)] and the latter two (*P. christophi* Kr. and *P. pulcher* Bless.) belong to relict fauna of two separate regions—the southern Urals and Ussuri-Primor'e region—but constitute a single ecological group, mainly associated with oak.

Type species: *Leptura detrita* Linnaeus, 1758.

KEY TO SPECIES

Adult Insects

1 (6). Scutellum glabrous or with barely perceptible brownish hairs, that do not form dense cover.

2 (3). Pronotum lustrous, with minute punctation, not matte. Europe, southern Urals. . . . . 1. **P. detritus** (L.).

3 (2). Pronotum matte, with dense punctation, without sheen.

4 (5). Anterior bands on elytra short, oblique, and do not extend forward. Pronotum without median crossband. Eastern Asia. . . . . 2. **P. christophi** Kr.

5 (4). Anterior bands on elytra long, markedly extend forward, almost reach rusty crossband at base. Pronotum with narrow median hairy crossband. Eastern Asia. . . . . 3. **P. pulcher** Bless.

125 6 (1). Scutellum densely pubescent, with white or yellowish hairs forming continuous fluffy cover.

7 (8). Elytra behind scutellum with common round hairy spot on suture, second band on them arcuate, turned forward. Europe, southern Urals. . . . . 4. **P. arcuatus** (L.).

8 (7). Elytra behind scutellum without round hairy spot on suture, second band on them not arcuate, straight, and only near suture extends backward slightly. Europe, Asia Minor; southwestern Siberia. . . . . 5. **P. floralis** (Pall.).

Larvae

1 (8). Pronotal shield lustrous, with longitudinal striation or wrinkles, and minute sculpture only at posterior end imparting matte texture. Found on deciduous trees.

2 (3). Eusternum glabrous, without long hairy field in middle of anterior half. Labial mentum transverse, laterally with dense hairy cover. Found on trunks of oak, mainly in lower zone. . . . . 1. **P. detritus** (L.).

3 (2). Eusternum with long hairy field in middle or anterior half, that sometimes continues into posterior half almost up to posterior margin.

4 (5). Labial mentum oblong. Found in lower zone of oak trunks, often in undergrowth. . . . . 2. **P. christophi** Kr.

5 (4). Labial mentum transverse.

6 (7). Pronotum with numerous hairs in prescutellar area, without dense rugulose punctation. Found on trunks of oak, in and under bark. . . . . 3. **P. pulcher** Bless.

7 (6). Pronotum with isolated hairs or without them in prescutellar area, with very dense rugulose punctation. Found on under growth and twigs of oak. . . . . 4. **P. arcuatus** (L.).

8 (1). Pronotal shield matte, without longitudinal streaks, covered with fine sculpture. Found on roots of herbaceous plants. . . . . 5. **P. floralis** (Pall.).

Pupae

1 (8). Abdominal tergites VII and VIII with several spinules forming transverse rows on posterior margin and disk.

2 (3). Spinules on pronotal disk do not form distinct median crossband. . . . . 1. **P. detritus** (L.).

3 (2). Spinules on pronotal disk from distinct median crossband.

4 (7). Metanotum with or without minute spinules.

5 (6). Pronotum posterolaterally with dense or scattered spinules forming one crossband on each side. . . . . 2. **P. christophi** Kr.

6 (5). Pronotum posterolaterally with isolated and very small spinules that do not form crossbands. . . . . 3. **P. pulcher** Bless.

7 (4). Metanotum with large and small spinules. . . . . 4. **P. arcuatus** (L.).

8 (1). Abdominal tergites VII and VIII with numerous spinules uniformly covering greater part (VII) or entire (VIII) surface. . . . . 5. **P. floralis** (Pall.).

126 1. **Plagionotus detritus** (L.)

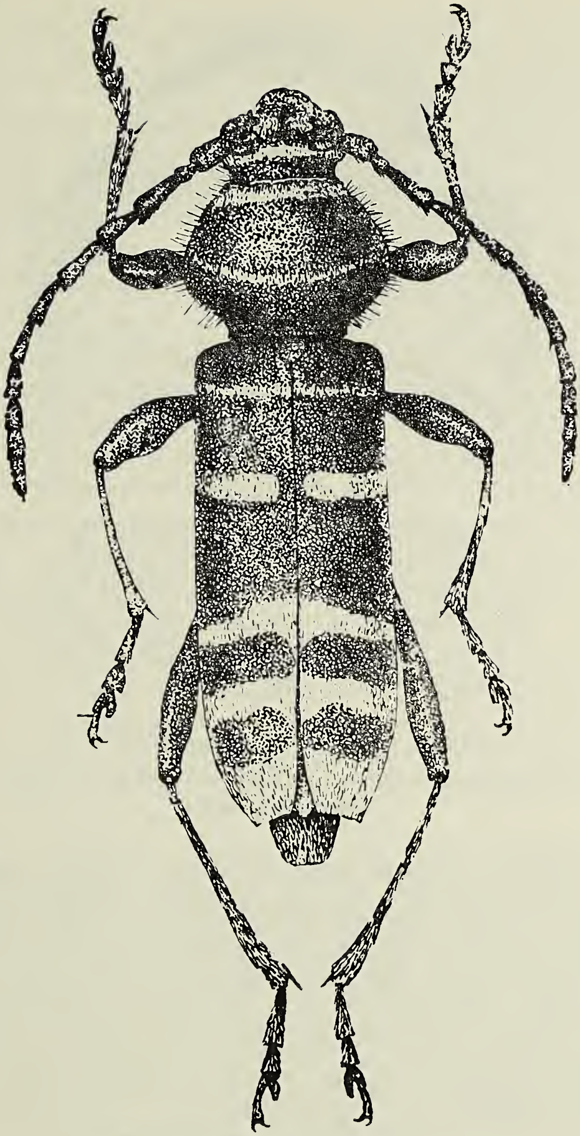
Linnaeus, 1758, *Syst. Nat.*, 10th ed., p. 399 (*Leptura*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 435; Duffy, 1953, *Monograph Immat. Stages of British and Imported Timber Beetles*, pp. 226–227; Demelt, 1966, *Tierwelt Deutschlands*, vol. 52, p. 78.

Adult (Figure 71): Readily identified by broad and lustrous pronotum, location of bands on elytra, and obtuse apex of latter. Head transversely convex between antennae, depressed on vertex, with narrow median longitudinal groove, uneven punctation, on anterior margin between lower lobes of eyes and before them with broad, behind antennal bases narrow, and behind eyes broadened densely hairy crossband. Antennae reach middle of elytra or extend beyond it, apically slightly produced on 3rd to 10th segments. Third antennal segment longer than 4th, equal to 5th, but shorter than 1st.

Pronotum transverse, markedly convex, laterally rounded in anterior half, narrows more posteriorly, with narrow constriction near posterior margin, small or uneven punctation, lustrous; sparse hairs posterolaterally, broad yellowish hairy border on anterior margin, sometimes additionally with narrow median transverse yellowish stripe. Scutellum broad, rounded posteriorly, glabrous.

Elytra convex, narrow notably toward apex, lustrous, with very fine dense punctation, compactly adherent hairs, transverse hairy bands, apically truncate or obtuse, with acute, sometimes slightly produced outer angle. Hind femora reach (male) or do not reach (female) elytral apex. Body ventrally with sparse, long, light-colored, erect or semierect hairs; posterior half of metathoracic episternum, posterior margin of abdominal sternites I to IV, and posterior margin of metasternum with dense and compactly adherent yellowish hairy cover. Body black, with brownish or rusty tinge; elytra with reddish-rust clearance along suture from scutellum. Antennae, tibiae, and tarsi rusty; femora dark brown, often
127 with rusty tinge. Elytra with narrow transverse, sparsely hairy, white stripe behind base; reduced, densely hairy, yellowish crossband before middle that does not reach suture and lateral margins; two densely hairy yellowish crossbands in posterior half that broaden near suture. Broad yellowish hairy border on apex usually joins posterior crossband (f. *typica*); sometimes narrow whitish stripe absent at base (ab. *inbasalis* Plav.); rarely elytra dark rust with reddish tinge (ab. *rufescens* Pic). Body length 10 to 21 mm.

Egg: White, elongate, broadly rounded or slightly obtuse at anterior pole, narrows toward posterior pole and here narrowly rounded or pointed. Chorion transparent, smooth, hyaline, with barely perceptible fine sculpture on obtuse part of anterior pole. Length 2.8 mm, width 0.8 mm.



126 Figure 71. *Plagionotus detritus* (L.).

Larva (Figure 72): Body large, massive. Half of head retracted into prothorax. Epistoma broadly notched on anterior margin, smooth, with broad and sharply prominent dark brown border in which short hairs along posterior margin from jumbled transverse row; sides of epistoma with very faint frontal sutures. Median suture lacking. Hypostoma broadens slightly toward front or with almost parallel sides, rounded outer anterior angles, brown border on anterior margin and here transversely rugulose. Gular plate, separating sclerites of hypostoma, broad,

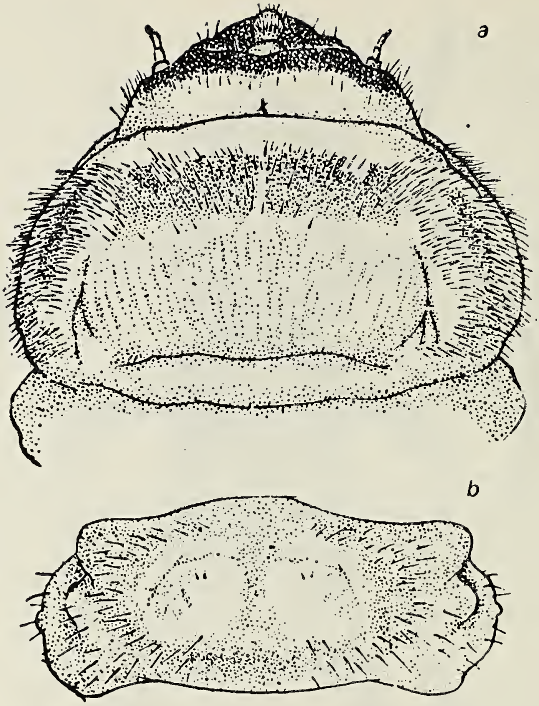


Figure 72. Larva of *Plagionotus detritus* (L.).
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

length 0.50 width, with slight notch on anterior margin. Parietals with broad dark rust or dark brown border on anterior margin that continues 128 backward far beyond antennal base, greater part with sparse, short, barely perceptible hairs, with three pigmented minute ocelli near antennal base forming transverse row. Antennae short. First segment whitish, remainder brownish; 2nd segment about 0.66 length of 3rd. Clypeus short, markedly flattened at base, and with brownish tinge. Labrum insignificantly elongate, with sharp constriction at base and rusty-brown here, narrows toward front, narrowly rounded at anterior margin; disk glabrous, margins with dense bristles, with whitish tinge. Mandibles thick, black, basally with narrow transverse groove on outer side. Inner masticatory lobes of maxillae lustrous, brownish, broaden toward apex, whitish apically, and with dense rusty bristles. Labial mentum transverse, laterally rounded, with dense rusty hairs, disk glabrous, in form of narrow longitudinal clearance.

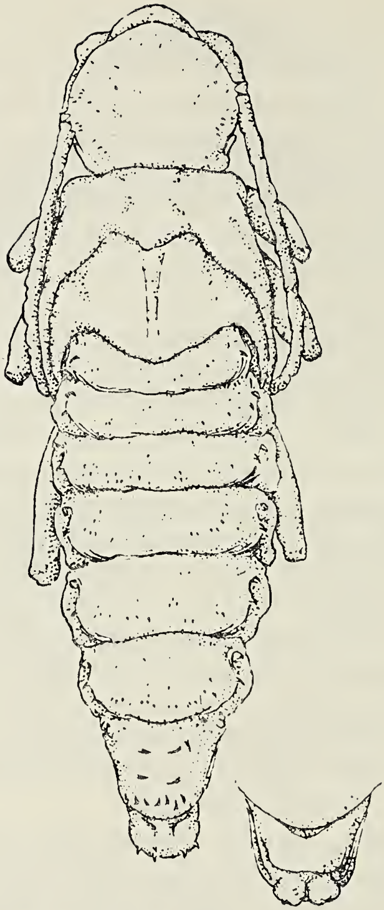
Pronotum 2.0 times wider than long, narrowly rounded anteriorly, with two transverse, rectangular rusty spots in anterior half, narrowly notched spots on anterior margin, oval glabrous rusty spot on sides, with sparse hairs before scutellum; anterior margin with transverse spots of dense or sparse rusty hairs that are always dense on sides. Pronotal shield white, convex, bound laterally by deep longitudinal groove, barely produced forward in middle of anterior margin, slightly truncate from here toward sides, with straight anterior angles, base with fine shagreen sculpture, ahead of it with short longitudinal crimped striation, and pair of widely separated bristles before posterior margin. Presternum with dense rusty hairs on sides and disk. Eusternum glabrous, leathery, with small wrinkles. Thoracic legs very small, with sclerotized short brownish claw.

Abdomen narrows slightly posteriorly, laterally with dense rusty hairs that continue onto dorsal surface and cover locomotory ampullae here. Dorsal locomotory ampullae slightly convex, divided by common median longitudinal groove, with narrow bracket-shaped transverse groove toward front, its sides bent backward, fine shagreen sculpture and alveolar depression posterolaterally. Ventral locomotory ampullae convex, with fine shagreen sculpture, devided by median transverse groove that joins short longitudinal or oblique groove on sides. Body length of mature larvae 23 to 28 mm, width of head 3.5 to 4.0 mm.

Pupa (Figure 73): Characterized by massive body and presence of large spinules on pronotum and abdominal tergites. Head convex between antennae, transversely depressed on vertex and toward front (before clypeus), facial part with coarse transverse wrinkles, without bristles. Antennae flexed to sides, apices slightly bent ventrad. First antennal segment transversely rugose, as if goffered.

Pronotum transverse, laterally rounded, disk moderately convex, with barely perceptible transverse wrinkles, anterior half and sides with large scattered sharp spinules, posterior slope glabrous and lustrous; posterior slope laterally with minute spinules forming narrow, barely perceptible longitudinal stripe. Mesonotum glabrous, insignificantly convex, with transverse saddle-shaped constriction behind middle, angularly produced posteriorly, with barely perceptible transverse streaks. Metanotum moderately convex, broadly rounded posteriorly, with median longitudinal transverse groove, and one short spinule laterally before middle.

129 Abdomen moderately elongate, broadens slightly in region of segments III to IV, narrows slightly toward base and gradually toward tip. Abdominal tergites convex, with common median longitudinal groove, short sharp spinules forming transverse row that is sometimes jumbled along posterior margin, and with two distinctly prominent rows along sides of longitudinal grooves (especially on tergites IV to VI). Tergite VII triangularly elongate, narrowly rounded posteriorly, with large spinules forming three transverse rows (of which hind row, comprising



127 Figure 73. Pupa of *Plagionotus detritus* (L.), female.

seven spinules bent forward, located on posterior margin of tergite; middle and anterior rows with two spinules each, bent toward each other, located posterior and anterior to middle respectively). Tergite VIII with parallel sides, rounded posteriorly, with four incurved spinules on posterior margin, and one large and two small spinules anteriorly. Valvifers of female large, highly contiguous, coarsely rugose at apex. Body length 12 mm, width of abdomen 5.0 mm.

Material: Collected in the southern Urals. Adult insects six, larvae 12, pupa—one female, larval and pupal exuviae from pupal cell with beetles four.

Distribution: Found from the Urals to the Atlantic coast, north from border of oak forests south to the Mediterranean Sea. Sporadic in broad-leaved forests of the southern Urals.

Biology: In floodplains of the southern Urals; found in plantations of broad-leaved forests. Ecologically associated here with oak (*Quercus robur*). Beetles emerge from mid-June to August. Found on oak trees, not seen on flowers. Female lays eggs in bark crevices on thick-trunked trees, predominantly in lower zone at height up to 2.0 m. One female can lay more than 28 eggs in her lifetime. Larvae emerge three weeks after oviposition. For example, from eggs laid by females on June 26 and 27, larvae emerged and bored bark about July 20. Atmospheric temperature during this period varied from 13.8 to 32.2°C (average 21.9°C).

Larvae live in and under bark, make longitudinal meandering galleries from top downward, and fill them with fine frass. Galleries usually leave no impression on alburnum, located in bark per se, sometimes visible on its inner surface. Very rarely, larvae make gallery before pupation which leaves impression on alburnum. Pupal cell scooped out longitudinal to trunk at end of gallery before or after second larval hibernation, with outlet in lower part of cell near surface of trunk, separated by small layer of bark on outer side. Pupal cells often constructed in bark, leaving no impression on alburnum, and rarely in upper layer of wood. Width of gallery before pupal cell 1.3 to 1.8 cm, in some cases enlarged up to 2.5 cm. Length of pupal cell 4.0 to 5.5 cm, width 1.1 to 1.3 cm.

Larvae pupate with head down, i.e., toward exit. Pupa lies in cell with ventral side toward trunk surface. Pupation commences in May and ends in second half of June. Larvae before pupation, pupae, and young beetles were found in openings of inhabited trees at end of third week of June.

Mature beetle makes oval exit (5.0 mm × 7.0 mm) on surface of bark and emerges from pupal cell through it. Emergence of beetles from pupal cells ends in first half or middle of July. Individual beetles survive for more than four weeks in chambers under a forest canopy. Weight of larvae before pupation (four specimens) 239 to 553 mg, pupae 209 to 498 mg, and young beetles before emergence from pupal cells 175 to 398 mg. Variation in weight characteristics is probably much greater under natural conditions.

130 Population density on trees is comparatively low. For example, five insects, including four larvae and one beetle, were found in the lower zone of an oak trunk 28 cm in diameter. In another case 11 middle-aged larvae were extracted from the bark of a trunk section (near root collar) 37 cm in diameter and 27 cm long. Physiologically weakened and recently dried oak trees are damaged. We did not find them on other trees. According to Demelt (1966), this species also develops on birch and rarely on chestnut.

2. **Plagionotus christophi** Kr.

Kraatz, 1879, *Deutsch. Entom. Z.*, vol. 23, p. 108; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 437–439; Kojima and Okabe, 1960, *Food Plants of Jap. Cerambycidae*, p. 139; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 79.

Adult (Figure 74): Close to *P. detritus* (L.). Differs in pronotum matte and elytra rusty at base and rounded at apex. Head transversely convex between antennae, with narrow median longitudinal groove; frons with minute and vertex with large dense punctation; anterior margin (frons, genae) with long erect hairs, toward front at level of lower lobes and behind upper lobes of eyes with dense adherent yellowish hairs, forming transverse stripes on both, and sparse whitish hair between antennae. Antennae extend beyond basal 0.66 of elytra (male) or reach midlength (female); from 3rd antennal segment apices produced, spinelike; lst segemnt slightly longer or almost equal to 3rd.

Pronotum transverse, matte; laterally from midlength rounded anteriorly and uniformly tapered posteriorly; disk markedly convex, with very fine dense (punctation spaces between punctures not smaller or smaller than punctures), erect brownish hairs: short yellowish hairs near anterior
131 margin form narrow transverse stripe or these hairs absent. Scutellum broad, flat, rounded anteriorly, glabrous, black, and highly prominent against red background of elytra.

Elytra with parallel sides or narrow slightly posteriorly, disk convex, continuously rounded at apex, with dense very fine punctation, very short, fine, adherent brownish hairs, and yellow hairy crossbands. Hind femora slightly (male) or distinctly (female) short of reaching elytral apex. Body ventrally with dense erect hairs. Episterna of meso- and metathorax with white adherent hairs forming one spot on each. Abdominal sternites I to IV with whitish hairy border on posterior margin that is medially interrupted. Body black; antennae, tibiae, and tarsi reddish-rust; femora black, base and apex rusty with reddish tinge. Elytra black, reddish or reddish-rust at base and in region of epipleura, light yellowish under hairy bands. Anterior band broad, reduced, short of reaching suture and lateral margins of elytra, and located obliquely before middle; second band narrow, longer, reaches suture and either reaches or falls slightly short of lateral margins, and located behind middle; third band less narrow, reaches suture but falls short of lateral margins. Elytral apex with yellowish hairy spotty border. Body length 13 to 16 mm.

Egg: White, elongate, broadens toward anterior pole and notably
132 pointed at end, but narrows toward posterior pole and narrowly rounded here. Chorion smooth, translucent, without perceptible sculpture. Length 1.8 mm, width 0.6 mm.

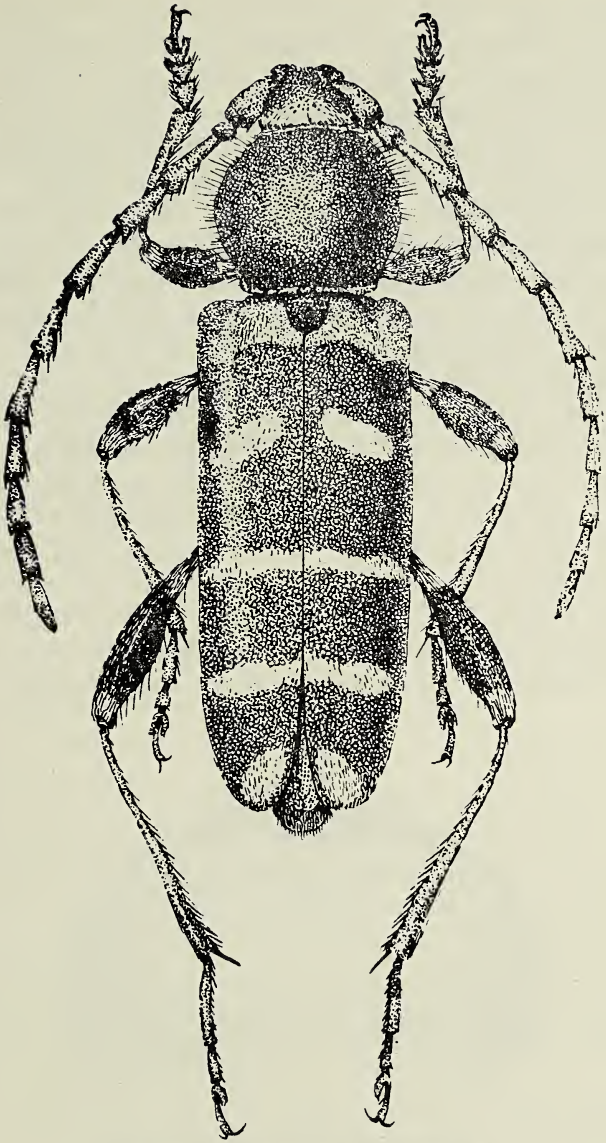


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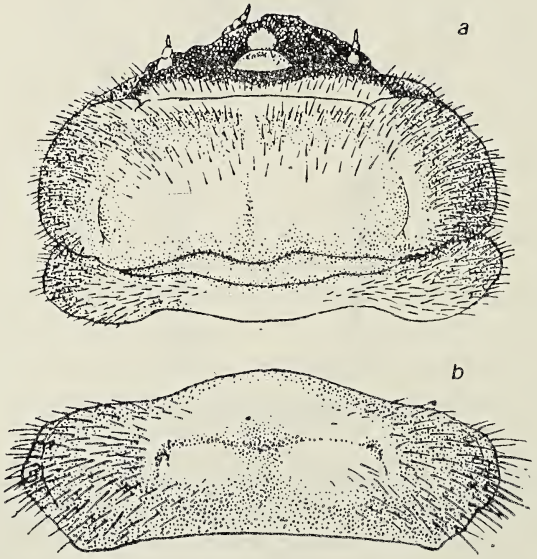
Figure 74. *Plagionotus christophi* Kr.

Larva (Figure 75): In structure of locomotory ampullae of abdomen, and density and arrangement of colored hairs on body similar to larva of *P. detritus* (L.). Differs in oblong labial mentum, presence of narrow hairy field on eusternum, and sculpture of ocelli near antennal base. Epistoma distinctly notched on anterior margin near clypeus, with broad border, behind which short hairs form crossband, and with indistinct frontal sutures. Median suture discernible only at apex. Hypostoma with parallel sides, narrow brownish-rust border on anterior margin, and with thin transverse streaks. Gular plate short, its length 0.66 width. Parietals rusty-brown in anterior half, with setaceous hairs in middle part forming short crossband. Antennae short; apices barely reach beyond anterior margin of cephalic capsule. Ocelli small, sparsely pigmented; dorsal ocellus dotlike, ventral transversely oval, elongate, 2.0 times larger than dorsal ocellus, and consists of two fused ocelli. In *P. detritus* (L.) all three ocelli well demarcated, not fused. Clypeus short, distinct at base, and with brownish border on anterior margin. Labrum narrows toward front, narrowly rounded at anterior margin, disk slightly convex and glabrous at base, with very dense rusty bristles along margins, and with narrow brownish basal border. Inner masticatory lobes of maxillae whitish at apex, with short dense bristles. Labial mentum oblong, with almost parallel sides, and with dense bristles posterolaterally.

Pronotum almost 3.0 times wider than long, much smoother toward front; transverse yellow spots in anterior half separated by narrow white clearance, anterior margin without perceptible notch; hairy cover on sides dense, combed backward, sparse on disk and forms two crossbands—one denser before yellow spots, the other relatively thin before shield. These two crossbands are interlinked by hairy longitudinal stripe extending medially between yellow transverse spots. Pronotal shield fairly convex,



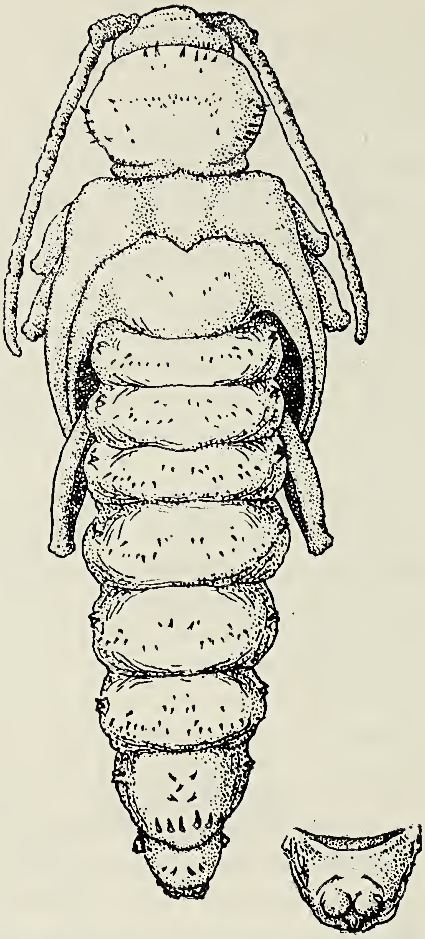
131 Figure 75. Larva of *Plagionotus christophi* Kr.
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

with two (slight) notches on anterior margin, medially with longitudinally rugose, elongate pattern of longitudinal streaks, posteriorly with fine sculpture, laterally bound by longitudinal, slightly curved, deep grooves, and with narrow median longitudinal groove. Presternum with very dense rusty hairs. Eusternum with glabrous leathery sclerite, anteriorly divided by hairy field that almost reaches posterior margin. In *P. detritus* (L.) this field is absent or extends backward no farther than middle of eusternum. Thoracic legs very small, caruncular, with barely perceptible sclerotized claw. Mesothorax, metathorax, and abdomen laterally with dense rusty hairs. Dorsal locomotory ampullae with transverse groove on anterior margin that arcs backward on first four tergites smoothly, more abruptly on subsequent (V to VII) tergites. Ventral locomotory ampullae medially divided by straight transverse groove that merges with lateral longitudinal grooves. Body length of mature larvae up to 20 mm, possibly more; width of head 3.5 mm.

Pupa (Figure 76): Differs from pupa of the closely related species *P. detritus* (L.) in arrangement of spinules on pronotum, which form crossband in middle. Head transversely rugose in facial part, without bristles and spinules, slightly convex between antennae, flat and slightly depressed
133 on vertex, and smooth, broadly rounded on occiput. Antennae with apices flexed to elytra, slightly bent ventrad at tip; 1st antennal segment, especially in female, transversely rugose, as if goffered.

Pronotum transverse, laterally rounded, disk slightly convex, and with thin transverse streaks; anterior third and sides with long, scattered, sharp, aristate spinules, with smaller spinules in middle forming transverse stripe; scattered or dense spinules posterolaterally form one crossband on each side; narrow transverse groove or narrow constriction occurs near posterior margin. Mesonotum slightly longer than wide, saddle shaped, dorsally with barely produced shield, and with faint transverse streaks. Metanotum broad, slightly convex, with distinct transverse pattern, with barely perceptible median longitudinal groove, and minute spinules forming more or less distinct stripes on each side that extend from middle toward anterior angle.

Abdomen elongate, slightly broadens at tergites III to IV, and gradually narrow toward posterior end. Abdominal tergites convex, with barely perceptible median longitudinal groove; posterior half with sharp spinules that form uniform or irregular transverse rows, which are widely interrupted medially (with six to nine spinules on each side of longitudinal groove); paired spinules medially on disk along sides of longitudinal groove form transverse row. Tergites IV to VI sometimes with two to four additional minute spinules in anterior third forming transverse row. Tergite VII moderately convex toward apex, narrowly rounded; six long and sharp spinules on posterior margin bent forward and form distinct



131 Figure 76. Pupa of *Plagionotus christophi* Kr., female.

transverse row; paired sharp spinules immediately behind and before middle bent inward, toward each other. Tergite VIII broadly rounded posteriorly, with four short small spinules on posterior margin forming transverse row. Valvifers of female large, hemispherical, adjacent but do not touch, and apically shagreen with pointed tubercle. Body length 18 to 22 mm, width of abdomen up to 5.0 mm.

Material: Collected in Ussuri-Primor'e region. Adult insects 67, larvae two, pupae—one male and three females, exuviae with beetles extracted from pupal cells seven. Series of larvae obtained from eggs laid by beetles in the laboratory.

Distribution: All of southeastern part of Central Asia (including lower Amur region, Ussuri-Primor'e region); northeast China, Japan.

Biology: Inhabits broad-leaved and mixed forests. Ecologically associated with oak. Emergence of beetles observed from end of June to August. During this period beetles are found on trees inhabited by them. Mating takes place here and females lay eggs in bark crevices. Beetles do not visit flowers. One female can lay more than 60 eggs in her lifetime. This species mainly lives in lower zone of oak trunks 6.0 to 10 0 cm in diameter. In the laboratory, at an average temperature of 20.3°C, larvae hatched from eggs 13 to 17 days after oviposition. We kept 31 eggs under observation.

Larvae live under bark, make longitudinal, rarely transverse, meandering galleries, and fill them compactly with frass from bark and partly from wood. Galleries leave very slight impression on alburnum (here wood appears slightly shaved off), and deeper impression in bark. Hence on removing bark, frass is separated from trunk with the bark, as though compacted in gallery on the inner side. Mature larvae bores wood, makes
134 pupal cell longitudinal to trunk with outlet at end, fills it with frass, and then pupates with its head facing toward outlet. Length of pupal cell up to 28 mm, width up to 10 mm. Diameter of exit in bark 5.6 to 6.7 mm. Sometimes pupal cells are constructed under bark.

Pupation takes place after second hibernation, mainly in June. Pupae found up to mid-July. Pupal stage continues for about three weeks. Young beetles appear at end of June and in July. They clear exit of frass, widen it, and emerge from pupal cells. Emergence of beetles from pupal cells commences end of June and terminates end of third week of July. We found the last beetle in a pupal cell on July 21. Beetles exit from wood with developed gonads. For example, the ovaries of one female dissected 10 days after emergence from wood contained 68 eggs, of another female dissected soon after emergence from wood 54 mature eggs. Beetles do not require supplementary feeding, and after emergence fly to trees priorly infested by them and begin to reproduce. Generation completed in two years (Table 7). Weight recorded at end of development highly variable. Weight of larvae (16 specimens) before pupation 86 to 330 mg, pupae 78 to 300 mg, and young beetles before emergence from pupal cells 64 to 210 mg.

Table 7. Periods of development of *Plagionotus christophi* Kr.

Year of development	April	May	June	July	August	September	October
1st	L	LP	LPAE	PAE	AEL	EL	L
2nd	L	L	L	L	L	L	L
3rd	L	LP	LPAE	PAE	AEL	EL	L

Plagionotus christophi Kr. develops only on oak, in lower zone of trunks of viable trees. We obtained 46 beetles from larvae collected from wood sections of these trees. Not found on other trees. Sometimes lives on recently felled wood. Population density comparatively high. For example, in the lower zone of a trunk of a viable oak we collected from a section about 7.0 cm in diameter and 30 cm long; one larva, seven pupae, and five adult insects. The same trees are inhabited concurrently with this species by *Pterolophia ussuriensis* Plav. (branches) and *Mesosa myops* Dalm. (trunks).

3. **Plagionotus pulcher** Bless.

Blessig, 1872, *Horae. Soc. Entom. Ross.*, vol. 9, p. 184; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 435–437; Kojima and Okabe, 1960, *Food Plants of Japan. Cerambycidae*, pp. 139–140; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 79.

Adult (Figure 77): In general body dimensions similar to *P. christophi* Kr. Differs in longer antennae, narrow crossband on pronotum, shape of bands on elytra, and other characters. Head with fine punctation, anterior margin (frons, clypeus, and genae) and behind antennae medially with moderately dense hairs forming transversely elongate spot. Antennae comparatively long, reach beyond middle of elytra (female) or
135 even apex (male). Antennal segments, commencing from 3rd, apically produced, spinelike; 3rd segment much longer than 4th; equal to 5th, but shorter than 1st.

Pronotum distinctly transverse, laterally rounded, narrows abruptly toward anterior margin and slightly more smoothly toward posterior margin, with narrow bent edge at anterior and posterior margins, disk uniformly convex, with minute and very dense punctation (spaces between punctures shagreen), matte, with short adherent hairs, medially interrupted yellow stripe near anterior margin, narrow continuous yellow hairy transverse stripe on disk, and yellow hairy border posterolaterally. Scutellum short, flat, broadly rounded anteriorly, and with minute, barely visible hairs.

Elytra with parallel sides or narrow slightly toward apex; apex obtuse, truncate or even slighty notched, sometimes with produced outer angle, with very fine dense punctation, minute adherent brownish hairs, and yellowish hairy crossbands. Hind femora reach (male) or fall slightly short (female) of elytral apex, rarely extend beyond it. Body ventrally with very sparse short erect hairs, or without them. Episterna of metathorax with longitudinally elongate yellowish hairy spot in posterior half. Abdominal sternites I to IV with yellowish hairy border on posterior margin that broadens laterally.

Body black. Antennae and legs rusty, femora often darken in middle or closer to apex. Sometimes pronotum with rusty rounded or divided

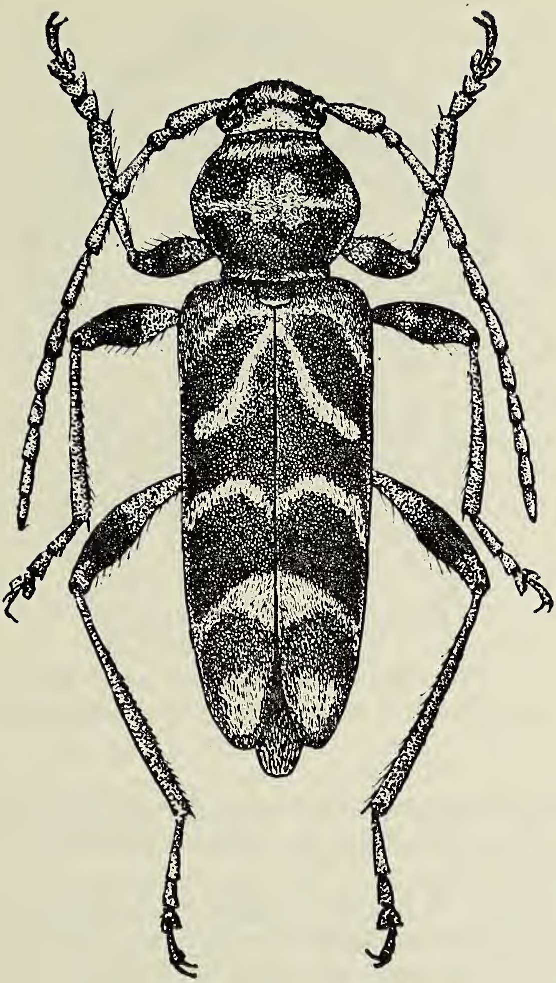


Figure 77. *Plagionotus pulcher* Bless.

rusty spot on disk (ab. *maculithorax* Pic). Elytra black, with reddish-rust transverse stripe near base that covers humeral tubercle on sides and curves backward here; crossband before middle almost originates from lateral margin, turns obliquely forward and toward suture, reaching latter just behind basal rusty stripe; narrow hairy band in middle of elytra arcs toward front, reaches suture and also lateral margins; crossband before posterior slope broadens near suture; and yellow hairy spot at apex sometimes forms border (f. *typica*). In some specimens elytra brownish-yellow at apex up to posterior band (ab. *praeapicalis* Plav.); sometimes 136 posterior (fourth) band markedly reduced at outer margin (ab. *posticerecurvatus* Plav.), or second band reduced on outer and inner margins (ab. *recurvatus* Plav.). Body length 10 to 18 mm.

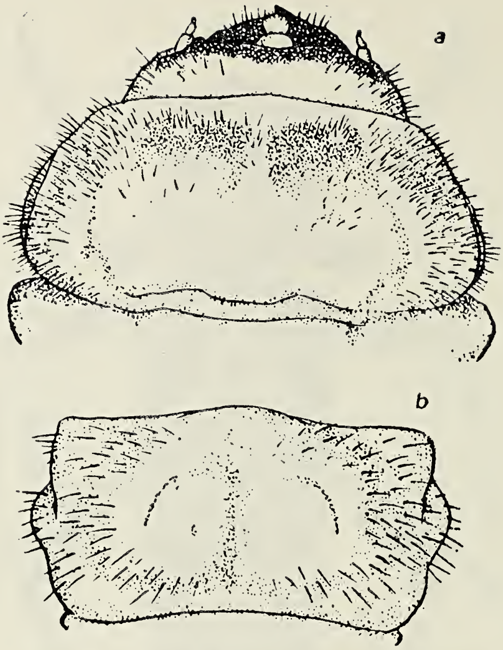


Figure 78. Larva of *Plagionotus pulcher* Bless.
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

Egg: White, elongate, broadly rounded at anterior pole and narrowly at posterior pole. Chorion smooth, lustrous, translucent. Length 1.7 to 1.8 mm, width 0.6 mm.

Larvae (Figure 78): Readily identified by presence of numerous hairs on epistoma, structure of dorsal locomotory ampullae, and other characters. Half of head retracted into prothorax. Epistoma slightly depressed apically and here with very distinct linear brownish or barely perceptible median suture; frontal sutures lacking on sides; anterior margin with broad notch (in mature larvae additional narrow notch near clypeus), with dark brown border, behind which numerous (comparatively dense) hairs form wide transverse field. Hypostoma broadens toward front, with frontally divergent lateral sutures, anterior margin with diffuse rusty-brown border and here with thin transverse streaks; border on posterior margin with sparse or numerous hairs (dense in mature larvae). Gular plate 2.0 times wider than long, with straightly truncate or slightly notched apex, and with brownish-rust ring. Parietals brownish-rust in anterior third, with darker border on anterior margin, and medially with numerous rusty hairs forming wide transverse field. Ventral sides near antennal base with three adjacent arrow-shaped, sometimes sparsely pigmented convex ocelli, arranged in transverse row. Antennae extend slightly

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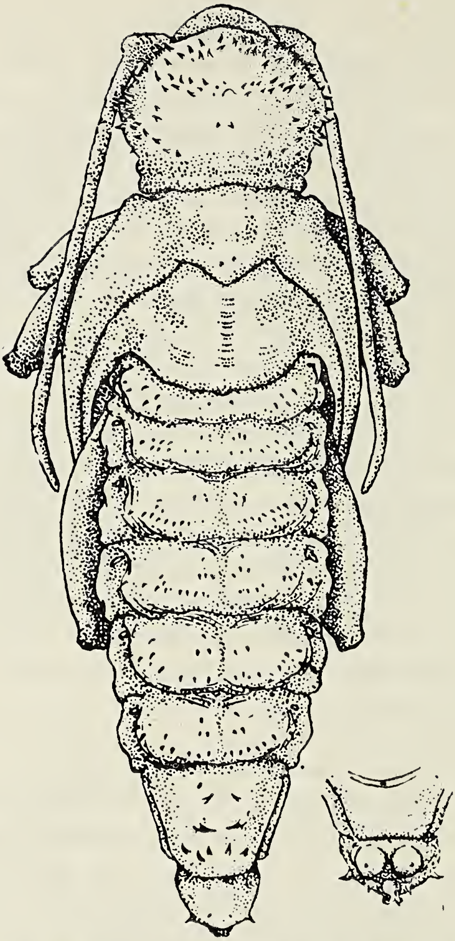
beyond anterior margin of cephalic capsule. Second and 3rd antennal segments rounded at base, with whitish tinge at apex. Clypeus short, channel shaped, with diffuse light brownish tinge at base. Labrum transverse, broadly rounded apically (in mature larvae) or narrows anteriorly and narrowly rounded at apex (in young and middle-aged larvae), disk glabrous, margins with long light-colored or slightly rusty bristles. Labial mentum transverse, laterally rounded, and here with dense rusty hairs. Mandibles massive, black, with smooth median notch on outer side.

Pronotum markedly transverse, about 3.0 times wider than long, with two transversely elongate rectangular yellow spots in anterior half, small alveolar notch on anterior margin, laterally with longitudinally elongate glabrous yellowish spot, on anterior margin with yellow spot covered with short hairs forming transverse and comparatively dense stripe, laterally with dense rusty short hairs bent backward, and before scutellum with sparse setaceous hairs. Pronotal shield lustrous, longitudinally rugose, bound laterally by deep and slightly curved longitudinal grooves, slightly produced forward in middle of anterior margin, with barely protruding anterior angles. Presternum with short and not very dense rusty hairs on sides and disk. Eusternum glabrous posterolaterally, in anterior half with broad prominent hairy field. Thoracic legs short, with very small and poorly sclerotized claw (claws of *P. christophi* Kr. sclerotized, dark brown).

Abdomen laterally with thin sparse hairs, in any case not very dense, and light colored [hairy cover on sides of abdomen in *P. detritus* (L.) and *P. christophi* Kr. dense and rusty]. Dorsal locomotory ampullae convex, with common median longitudinal groove, at anterior margin with transverse groove bent backward on sides; disk with short, sometimes indistinct groove, originating from anterior angles and extending obliquely toward middle and posterior end. Ventral locomotory ampullae transversely elongate, shagreen; disk with median transverse groove that joins longitudinal fold on sides. Body length of mature larvae up to 30 mm, width of head 4.0 to 4.5 mm.

Pupa (Figure 79): Very similar to pupa of *P. christophi* Kr. Differs in absence of very minute spinules posterolaterally on pronotum. Head flat on facial side, with more (female) or less (male) distinct transverse wrinkles. Frons between antennae not convex, almost in same plane as vertex. Antennae flexed to sides, slightly bent at apex (female) or conspicuously bent ventrad (male).

Pronotum slightly transverse, broadens angularly medially, narrows almost equally toward anterior and posterior ends, with very narrow transverse groove near base, disk moderately convex, with thin transverse streaks, anterior third and sides with large sharp aristate spinules bent toward middle, with minute spinules medially forming narrow trans-



136 Figure 79. Pupa of *Plagionotus pulcher* Bless., female.

verse stripe. Mesonotum convex, with transverse wrinkles, produced shield on posterior margin, and laterally with longitudinal notch. Metanotum uniformly convex, with transverse streaklike wrinkles, median longitudinal groove, and with or without stray, barely perceptible spinules on sides.

Abdomen elongate, narrows gradually posteriorly. Abdominal tergites moderately convex in posterior half, with distinct median longitudinal
138 groove; posterior margin with sharp spinules directed backward, forming distinct transverse row interrupted by slight longitudinal groove; four to six spinules immediately behind middle form jumbled transverse row; anterior half of sternites IV to VI with one or, more often, two widely separated minute spinules. Abdominal tergite VIII triangular, rounded

posteriorly, moderately convex, in some specimens with transverse wrinkles; posterior margin with five, rarely four or six, large sharp spinules bent forward, forming transverse row; large spinules before and behind middle bent toward each other and form two transverse rows. Tergite VIII narrows more (male) or less (female) toward posterior end; posterior margin with four spinules bent forward. Spinules in some specimens large, in others small; sometimes spinules occur laterally and on disk of this (VIII) tergite. Valvifers of female large, tentlike, slightly shifted, and with sharp apical tubercle. Body length 18 to 20 mm, width of abdomen up to 4.0 mm.

Material: Collected in Ussuri-Primor'e region. Adult insects 45, larvae 61, pupae—four males and five females, larval and pupal exuviae with beetles obtained from pupal cells 15.

Distribution: Lower Primor'e, Ussuri-Primor'e region, Sakhalin and Kunashir Islands; Japan (Hokkaido, Honshu), northeast China, Korean Peninsula. Common in regions of Khasan, Vladivostok, and Ussuriisk.

Biology: Inhabits broad-leaved and mixed forests in which oak present. Beetles emerge from end of June to early August. Usually do not visit flowers, and found at time of emergence on trees of oak inhabited by them. They mate, and female lays eggs in bark crevices. Thick trunks of drying and fallen trees as well as newly uprooted trees in felled areas are mainly inhabited. Egg development from time of oviposition to hatching of larvae at 19.9 ± 0.5°C continued for 14 to 18 days (average 16.5 days).

Larvae live under bark, make longitudinal, sometimes meandering or transverse galleries, leaving no impression on alburnum, and fill them with fine frass containing bark. Hibernation takes place twice. Pupal cell made at end of gallery in bark before second hibernation or after it in the following spring and larva pupates inside it. Width of gallery before pupal cell 9.0 to 12.0 mm, length of pupal cell 24 to 35 mm, width 6.0 to 12.0 mm.

Pupation commences end of May and terminates in June. Pupae found in small numbers in second half of June. They develop for about three weeks. For example, one pupa required 20 days at 20.4 ± 0.8°C to develop. Young beetles emerge from pupae at end of June and in July. Development of individual insects delayed up to August. Fully formed beetles cut round exits of 4.0 to 5.0 mm in diameter on surface and exit from pupal cells. They require no supplementary feeding and
139 begin to reproduce soon after their emergence. Life cycle completed in two years (Table 8). In weighing 27 individuals during metamorphosis, it was established that larvae before pupation ranged in weight from 71 to 359 mg, pupae 60 to 328 mg, and young beetles before emergence from wood 45 to 239 mg.

138 **Table 8. Periods of development of *Plagionotus pulcher* Bless.**

Year of development	April	May	June	July	August	September
1st	L	LP	PAE	PAEL	AEL	L
2nd	L	L	L	L	L	L
3rd	L	LP	PAE	PAEL	AEL	L

Plagionotus pulcher Bless. develops on oak. We raised 32 beetles from larvae collected from oak. No insects were found on other trees. According to Kojima and Okabe (1960), this species also develops on Dahurian birch (*Betula dahurica*).

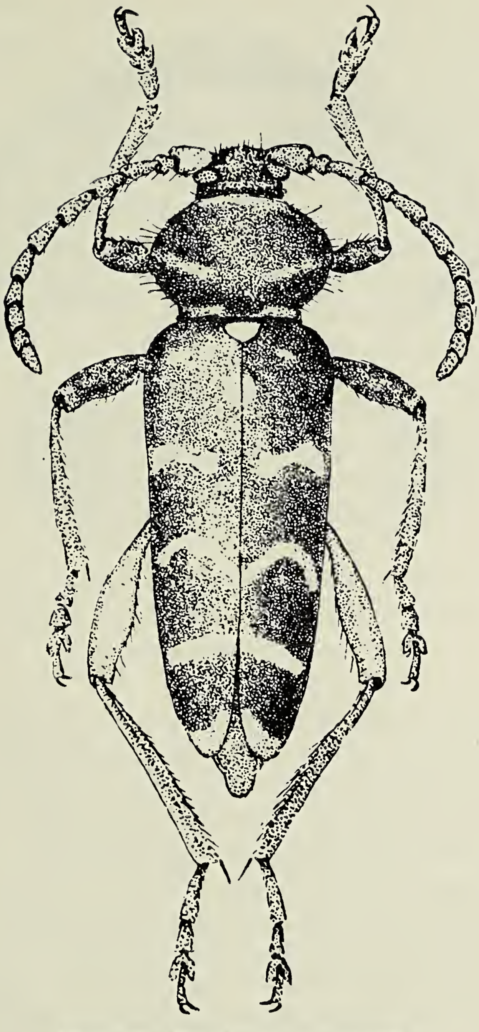
4. **Plagionotus arcuatus** (L.)

Linnaeus, 1758, *Syst. Nat.*, 10th ed., p. 399 (*Leptura*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 439–433 [*sic*]; Duffy, 1353, *Monograph Immat. Stages of British and Imported Timber Beetles*, pp. 225–226; Demelt, 1966, *Tierwelt Deutschlands*, vol. 52, p. 77.

Adult (Figure 80). Differs from other species of this genus in densely hairy scutellum, typical pattern on elytra, and other characters. Head with fine dense punctation with light-colored and adherent hairs, on margin (frons) with broad and behind eyes (before occiput) narrow transverse, densely hairy, yellow stripe. Antennae extend beyond middle of elytra (male) or only up to midlength. Antennal segments, commencing from 3rd or 4th apically produced.

Pronotum transverse, laterally rounded, broadens markedly in middle, with erect brownish hairs, disk convex, very fine dense punctation, matte, with yellowish hairy border on anterior and posterior margins, especially along sides, and oblique yellow hairy crossband on each side behind middle. Sometimes these bands merge into common transverse stripe. Scutellum flat, rounded posteriorly, with dense yellow adherent hairs.

Elytra narrow slightly toward apex, entirely rounded apically, disk convex, broadly depressed on inner side of humeral tubercle, with very fine dense punctation, short compactly adherent brownish hairs, with yellow hairy spot and crossband. Body ventrally with numerous erect
140 and semierect light-colored hairs. Pro-, meso-, and metathorax with yellow hairy spots laterally in region of episternum. Abdominal sternites I to IV with broad yellow hairy border on posterior margin. Body black. Antennae and legs reddish-rust. Elytra black, behind scutellum along suture sometimes with short rusty stripe, with short crossband near base on inner side of humeral tubercle, on side under humeral tubercle with



139 Figure 80. *Plagionotus arcuatus* (L.).

longitudinal hairy stripe, common round spot on suture behind scutellum, before middle with zigzag crossband, dotlike thickened crossband near suture, narrow highly arcuate band behind middle, slightly forwardly curved yellow hairy crossband before posterior slope, and yellow hairy border at apex (f. *typica*). In some specimens zigzag crossband represented by just an isolated spot (ab. *multiinterruptus* Pic, ab. *disjunctus* Plav.). Sometimes bands anastomose behind middle (ab. *pagnioni* Pic, ab. *semiconfluens* Plav.) or form broad common crossband (ab. *colbeaui* Mors., ab. *buyssoni* Dauf.). Body length 8.0 to 21.0 mm.

Egg: White, narrows more toward posterior pole, less toward anterior pole, narrowly pointed at former, broadly rounded at latter. Chorion

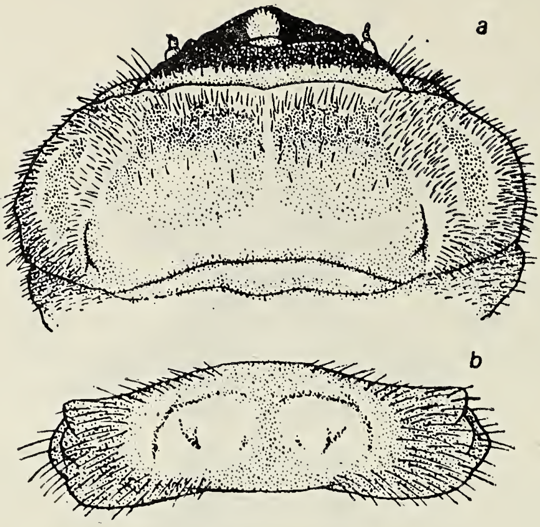


Figure 81. Larva of *Plagionotus arcuatus* (L.).
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

translucent, smooth, with fine sculpture at poles that barely visible under high magnification. Length 2.0 to 2.1 mm, width 0.7 mm.

Larva (Figure 81): Characterized by short, bidentate pronotal shield, coarse punctation of latter in prescutellar region, and other characters. Body massive. Head markedly retracted into prothorax, narrows smoothly toward front. Epistoma with broad notch on anterior margin, broad and distinct dark brown (in mature larvae almost black) border, behind which thin short light-colored hairs form crossband. Frontal sutures indistinct or not discernible laterally. Median suture perceptible only at apex in form of short longitudinal brownish line. Hypostoma broadens 141 slightly toward front, with rounded anterolateral angles, with distinct transverse wrinkles, and on anterior margin narrow reddish or rusty-brown border, behind which stray short setaceous hairs occur. Gular plate broad, with notch on anterior margin, and narrow brownish border. Parietals with hairs in middle forming transverse field, in the anterior half rusty-red with transverse groove extending from antennal socket to hypostoma, grooves on back side, and three convex ocelli forming crossband. Antennae short, barely reach beyond anterior margin of cephalic capsule. Clypeus trapezoid, flat at base, with brownish tinge. Labrum narrows toward front, narrowly rounded apically, with short light-colored sparse bristles along margin, disk convex and glabrous, base rusty-brown, whitish toward front. Mandibles massive, black, matte on outer side, lustrous only near cultrate margin. Labial mentum with almost parallel sides, transverse, barely narrows toward base, laterally with dense rusty bristles, glabrous in middle part. Inner masticatory lobes of maxillae thick, rusty-brown, whitish at apex and here with long bristles. Maxillary palps long; 2nd segment extends beyond apex of inner lobes.

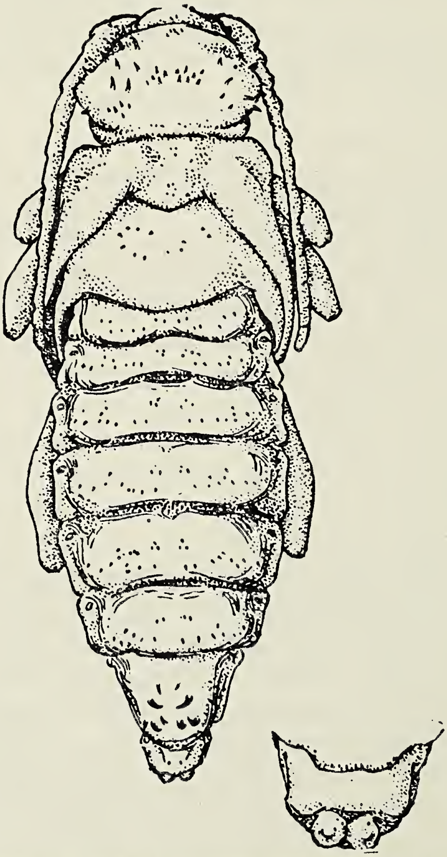
Pronotum 2.5 times wider than long, fairly smooth toward head, rounded laterally, disk before scutellum with dense, coarsely rugose punctation and sparse random hairs; anterior third with two transversely elongate rusty spots with an uneven notch on anterior margin; sides with longitudinally elongate, lustrous, glabrous, yellowish-rust, mottled spot; disk with dense rusty hairs before rusty spots and on sides. Pronotal shield convex, white, short; anterior margin bidentate and markedly produced forward medially; fine longitudinal streaks on sides bound by very short, coarse longitudinal grooves; pair of short, somewhat separated bristles medially near base. Presternum laterally and on disk with very dense uniform rusty hairs. Eusternum laterally and posteriorly glabrous, lustrous, medially with rusty hairs toward front that merge into common hairy field of presternum. Thoracic legs small; claws short, spinelike, dark brown.

Abdomen thick; laterally, ventrally, and dorsally (near locomotory ampullae) with dense fairly long rusty hairs. Dorsal locomotory ampullae convex, leathery, with microsculpture imparting matte texture, divided by common deep median longitudinal groove, anterior margin with transverse groove that joins lateral longitudinal outcurved groove; sides of disk with paired short adjacent rusty bristles arising from longitudinal grooves; small lateral alveolar depression or short groovelike fold extends from anterior angles backward and toward middle. Ventral locomotory ampullae matte, with median transverse groove that joins lateral longitudinal groove; anterior margin with three short rusty bristles forming triangle (sometimes only two bristles discernible). Body length of mature larvae 25 to 29 mm, width of head 4.5 to 4.8 mm.

Pupa (Figure 82): Very similar to pupa of *P. detritus* (L.). But, unlike the former, readily identified by presence of large spinules on metanotum. Body large, comparatively thick. Head narrows cuneiformly toward front, transversely convex between antennae, slightly depressed at vertex; short transverse wrinkles on frons from median longitudinal stripe; pair of widely separated short and indistinct bristles, visible only
142 under high magnification, form transverse row near anterior margin of frons. Antennae flexed to sides, with apex slightly bent ventrad.

Pronotum transversely oval, laterally rounded, disk convex, transversely patterned, appears compressed near anterior angles on upper side, with narrow short transverse groove on sides before posterior angles, with large subulate spinules forming crossband in middle consisting of two jumbled rows. Spinules scattered, do not form groups on sides, posterior slope before posterior angles, and near anterior margin of disk. Mesonotum slightly convex, with transverse, coarse, almost rugose striation, angularly produced toward posterior margin, and with minute dotlike spinules. Metanotum slightly convex, with narrow median longitudinal groove, barely perceptible transverse streaks, broadly rounded on back side, with large acute and dotlike obtuse sclerotized spinules forming one group each along sides of longitudinal groove.

Abdomen broadens insignificantly in region of segments III to IV, narrows slightly toward anterior end and markedly toward posterior end. Abdominal tergites convex, with an indistinct median longitudinal groove; sharp and fine obtuse spinules form transverse row or crossband in posterior half closer to posterior margin, with one group of three paramedial spinules on either side near longitudinal groove, sometimes



140 Figure 82. Pupa of *Plagionotus arcuatus* (L.), female.

with transverse raw of dotlike spinules near anterior margin. Abdominal tergite VII narrows from anterior margin toward posterior, narrowly rounded on posterior margin, with six large spinules in posterior half bent forward, forming posterior transverse row; two incurved equal-sized spinules form median transverse row; anterior half with two small, almost erect spinules forming transverse row. Tergite VIII transverse, broadly rounded toward back side, disk with two to four small obtuse or large sharp spinules. Valvifers of female large, contiguous, broadly rounded at apex, and with coarse wrinkled hairs. Body length 18 mm, width of abdomen 5.0 mm.

Material: Collected in the southern Urals. Adult insects five, larvae nine, pupa—one female, larval and pupal exuviae with beetles from pupal cells one each.

Distribution: Europe; coast of Atlantic Ocean to the southern Urals, from the Mediterranean Sea to Scandinavia. In the southern Urals found within limits of area covered by oak.

Biology: Inhabits deciduous forests and ecologically predominantly associated with oak. Emergence of beetles from June to July. Beetles found on trees inhabited by them and are most active in warm clear weather. Female lays eggs in bark crevices. Ovaries of one female collected from tree contained 42 mature eggs. From eggs laid by females end of June, larvae hatched mid-July. They bored bark about July 20. Atmospheric temperature during this period ranged from 13.8°C in the mornings to 32.2°C later in the day, with an average of 21.6°C.

Larvae live under bark, make galleries longitudinal to branch from lower to upper side, and fill them with fine frass containing wood and bark. Galleries deeply impressed (with sharp margins) in wood and on inner side of bark. Sometimes they fuse into broad platforms under bark that are compactly packed with frass. Mature larvae gradually bore into wood at an angle of 45 to 60°, make longitudinal gallery there at depth of 1.0 to 3.0 cm, cut exit in bark at end of gallery and plug it (sometimes
143 at some distance from bark) with coarse fibrous frass, and pupate in resultant pupal cell with head directed toward exit. Pupal cell made in trunks with thick wood under bark leave impression in upper layer of wood. Length of gallery under bark 19.5 to 29.0 cm, width 10 to 45 mm. Area of bast destroyed by larvae varies from 9.5 to 40.6 cm. Width of entrance into wood 8.0 to 10.0 mm. Length of pupal cell up to 25 mm, width about 10 mm. Larvae complete pupation after second hibernation. In June beetles and middle-aged larvae found simultaneously. Generation completed in two years. Records of five specimens revealed: weight of larvae before pupation varies from 196 to 492 mg, pupae 175 to 441 mg, and beetles before emergence from wood 145 to 353 mg.

Plagionotus arcuatus (L.) damages thin branches as well as thick trunks of fallen and standing trees, and often inhabits recently cut stumps in forest clearings. Population density relatively high. For example, one piece of an oak branch 45 cm long and up to 5.0 cm in diameter contained six last-instar larvae. According to published reports (Plavil'shchikov, 1940; Demelt, 1966), this species damages mainly oak, rarely chestnut, birch, linden, willow and other deciduous trees. We found it only on oak.

5. **Plagionotus floralis** (Pall.)

Pallas, 1773, *Reis. Prov. Russ. Reich.*, vol. 2, p. 724 (*Cerambyx*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 451–455; Nikolaev, 1954, *Tsvetochnyi usach*, pp. 1–16; Demelt, 1966, *Tierwelt Deutschlands*, vol. 52, p. 78.

Adult (Figure 83): Distinguished from other species by characteristic narrow elongate body, broad transverse bands on elytra, comparatively short legs, and continuous dense adherent hairy cover on ventral surface of body. Head with fine dense punctation that is sparse on occiput, median longitudinal groove between antennae, frons entirely covered with gray or grayish-yellow adherent hairs, posterior margin of vertex with not very dense, hairy, transversely elongate spot or without it. Antennae barely reach middle of elytra (male) or short of it (female); 3rd segment longer than 5th, almost equal to or shorter than 1st; 11th segment pointed at apex.

Pronotum just slightly or not wider than long, laterally rounded, disk uniformly convex, with very dense punctation, sides with sparse thin erect hairs, anterior margin with yellow hairy border, posterior slope with broad stripe, posterior margin with narrow yellow hairy border along sides. Scutellum broad, broadly rounded posteriorly, and covered with dense yellow adherent hairs.

Elytra elongate, with parallel sides, convex, entirely rounded at apex, with very fine dense punctation, adherent brownish hairs, with dense yellowish hairy crossbands imparting appearance of pattern of transverse stripes. Legs short, hind femora extend beyond middle third of elytra. Ventral surface of body entirely covered with dense adherent yellowish hairy cover, with background of sparse, at places isolated, semierect setaceous hairs. Body black or blackish-brown with rusty tinge, legs and antennae rusty. First antennal segment (especially at base) and femora sometimes darkened. Elytra black or dark brown, with transverse yellow hairy stripe at base that is interrupted near scutellum; second quarter anteriorly with crossband that elongates to point toward front near suture; middle part with crossband that sometimes curves slightly
144 backward near suture; broad straight crossband before posterior slope

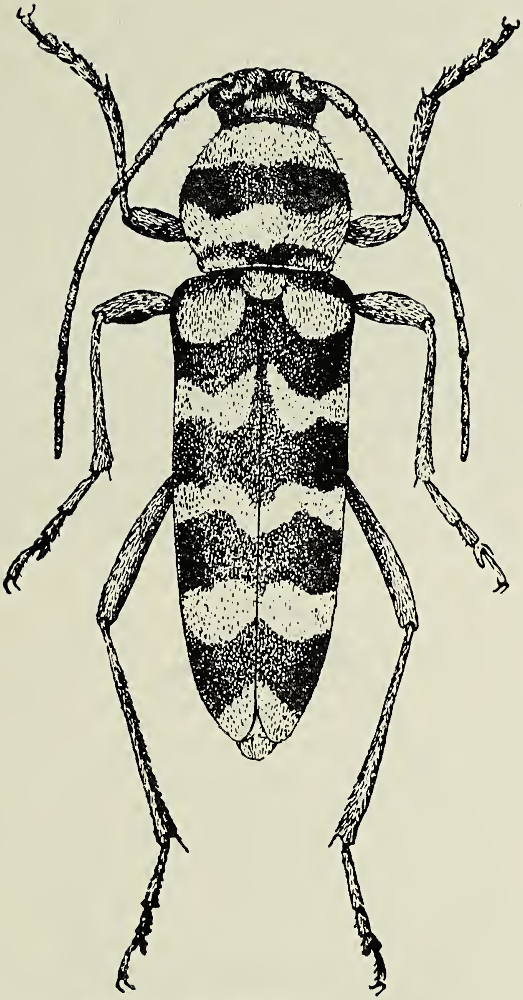
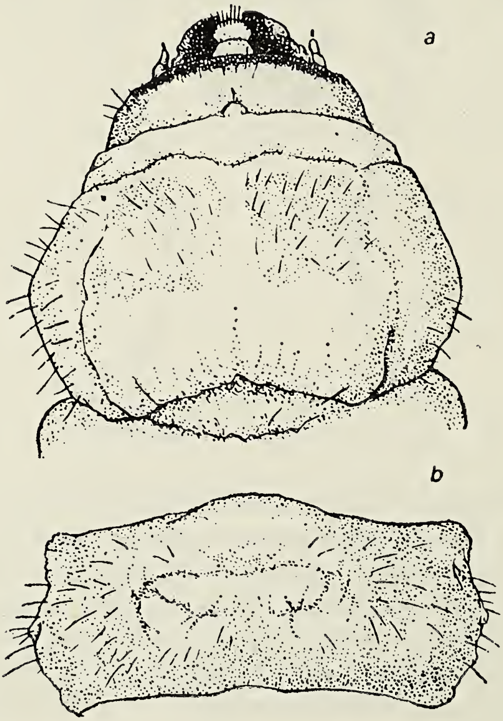


Figure 83. *Plagionotus floralis* (Pall.).

with notch toward front near suture or interrupted; apex with yellow hairy border (f. *typica*). Sometimes two anterior bands on disk in form of two spots, and posterior band markedly reduced (ab. *duodecimguttatus* Plav.), or elytra and pronotum almost entirely covered with dense yellow hairy cover (ab. *variabilis* Motsch.,), or spaces between bands inconspicuous (ab. *pruinosus* Kr.). Body length 7.0 to 18.0 mm.

Egg: Tinted green, moderately elongate, insignificantly narrows toward poles, at anterior pole broadly (obtusely), posterior pole more narrowly rounded. Chorion translucent, matte, with barely perceptible fine sculpture. Length 1.5 mm, width 0.5 mm.

Larva (Figure 84): Differs from other species of *Plagionotus* in structure of pronotal shield, sparse hairy cover, and other characters. Head narrows slightly toward front. Epistoma slightly convex, slightly depressed at apex, without perceptible notch on anterior margin, with very distinct broad reddish-brown border, and covered behind with stray short setaceous hairs. Frontal sutures indistinct. Median suture perceptible as short brownish line at apex. Hypostoma narrows slightly toward front, with straight sutures on sides, anterior margin with broad rusty border. Gular plate narrows significantly toward front, anterior margin straightly truncate, rusty-brown, whitish only near base. Parietals reddish to dark brown in anterior third, with oblique white gap behind antennae, in middle part with sparse (stray) setaceous hairs. Ocelli barely perceptible near antennal base. Antennae whitish, with brownish tinge at apex, slightly prominent behind anterior margin of cephalic capsule. Clypeus trapezoid, 2.0 times wider than long, and slightly flattened at base. Labrum narrows toward front, rounded at apex, anterior half with dense short bristles. Mandibles black, with transverse groove on outer



145 Figure 84. Larva of *Plagionotus floralis* (Pall.).
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

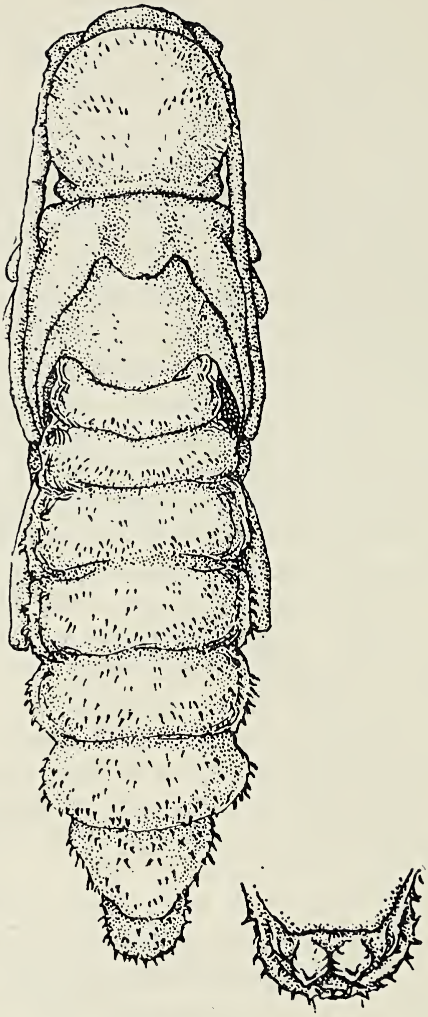
side near base, and channel-shaped longitudinal depression in middle part. Labial mentum transverse, slightly rounded laterally, and here with bristles forming small group. Inner masticatory lobes of maxillae short, not longer than wide, with light bristles at apex.

145 Pronotum narrowly rounded toward front, slopes significantly toward head, with two transverse rectangular rusty spots in anterior third, without alveolar notch on anterior margin, with longitudinally elongate rectangular spot on sides (rusty spots with white dots); sides and anterior third with sparse light hairs in region of rusty spots, glabrous before scutellum or covered with stray hairs. Pronotal shield white, matte, without perceptible longitudinal wrinkles, bound laterally by shallow longitudinal folds, with narrow median longitudinal groove, slightly produced forward in middle part of anterior margin, and with pair of somewhat separated bristles in middle part of base. Presternum with short, not very dense rusty hairs; eusternum with sparse hairy cover in middle part, laterally glabrous, without hairs, and with rusty tinge. Thoracic legs short, very small, with barely perceptible and poorly sclerotized claw.

Abdomen moderately elongate, in early instar larvae gradually narrows posteriorly, at later stage carinate, and with short sparse rusty or light-colored hairs laterally. Dorsal locomotory ampullae fairly convex, divided by common deep median longitudinal groove, disk with fine shagreen sculpture, sides with barely noticeable longitudinal fold, and sometimes with transverse groove at anterior margin. Ventral locomotory ampullae with fine sculpture, sides with short longitudinal groove, with short transverse groove originating from middle of former. Tergite
146 IX with dense rusty hairs in posterior half. Body length of mature larvae up to 20 mm, width of head about 3.0 mm.

Pupa (Figure 85): Differs well from pupae of other species of this genus in absence of large and presence of numerous minute spinules on abdominal tergites VII and VIII. Head comparatively narrow, slightly depressed on vertex and before clypeus, not very conspicuously near antennal base, with median longitudinal groove and one bristle on each side of it. Antennae tightly flexed to sides, with apices extending beyond 1st abdominal segment.

Pronotum slightly wider than long, smoothly rounded laterally with narrow transverse groove near base, uniformly convex and smooth on disk, without transverse streaks, with short aristate spinules along sides in anterior third and near posterior angles, with fine spinules in middle of disk forming broad crossband, and posterior slope glabrous, lustrous. Mesonotum slightly convex, posterior margin with broadly rounded elongate shield, and behind middle with barely perceptible transverse saddle-shaped depression. Metanotum convex, width negligibly more than length, with barely perceptible median longitudinal groove with



145 Figure 85. Pupa of *Plagionotus floralis* (Pall.), female.

narrow transverse streaks on it, and sides with scattered stray, barely noticeable bristles.

Abdomen elongate, narrows slightly toward anterior end, more toward posterior end. Abdominal tergites convex, with slight common median groove, posterior margin with dense numerous sharp spinules forming continuous or narrow discontinuous crossband in middle, toward front with small spinules forming median row, and sparse crossband near anterior margin. Abdominal tergite VII triangular, rounded posteriorly, convex on disk, with sharp small spinules forming crossband in posterior third and group in anterior half. Tergite VIII broadly rounded posteriorly, disk convex, entirely covered with minute, almost uniformly scattered spinules. Valvifers of female hemispherical, notably plicate along margins, and with small apical tubercle. Body length up to 18 mm, width of abdomen about 4.0 mm.

Material: Collected in forest-steppe zone of Ob' region and the southern Urals. Adult insects 380, larvae three, of which two developed from eggs in the laboratory, and pupa—one female.

Distribution: West and eastern Europe, Asia Minor, southwest Siberia (from the southern Urals to Altai and the Ob' River). Found in large numbers in the southern Urals and on left bank of the Ob' throughout its course.

Biology: Predominantly inhabits open areas in the forest-steppe zone. Ecologically associated with alfalfa and other herbaceous plants. Beetles emerge from June to August, isolated individuals found even beginning of September. In the Upper Ob' region 182 beetles were collected in one season: 8.8% in June, 88.4% in July, 2.2% in August, and 0.6% in early September. Mass emergence of adults in the southern Urals observed end of June and in first half of July. Beetles visit flowers of Leguminosae, Asteraceae, Umbelliferae, Rosaceae, and other plants. After mating, female lays eggs in the soil near stems of herbaceous plants. According to published reports (Nikolaev, 1954; Demelt, 1966), they inhabit plants of alfalfa (*Medicago sativa*), sainfoin, amaranth, camel thorn, melilot, and others. Fecundity of beetles comparatively high. According to Nikolaev (1954), up to 120 to 200 eggs develop in the ovaries of a single female. We found 33 mature eggs in the ovaries of a female collected from alfalfa on June 30. Duration of egg development two to three weeks. In chambers placed under a forest canopy larvae 147 hatched 14 to 20 days after oviposition (90 eggs under observation) at 14.4 to 32.2°C (average 20.2°C).

Hatching of larvae begins in July and terminates end of August. Young larvae move relatively fast along depression in soil, search for stems or roots of plants, bore into them, leaving entrance at surface filled with white frass that looks like a white spot. Initially larva lives under bark, makes longitudinal gallery, fills it with fine frass, then penetrates pith and continues gallery along roots. Length of gallery in alfalfa root up to 18.5 cm, width 3.0 to 4.0 mm. Mature larvae destroy almost all the root tissues. Pupation take place at end of May and in June. Young beetles predominantly appear in mid-June, leaving place of reproduction usually at end of June and in July. They live for about three to five weeks. In northern Caucasus generation completed in one year (Nikolaev, 1954), but in the southern Urals and western Siberia in two years.

7. Genus *Chlorophorus* Chevr.

Chevrolat, 1863, *Mem. Soc. Sc. Liege*, vol. 18, p. 290; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 455–456; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 270; Mamaev and Danilevskii, 1975, *Lichinki zhukov-drovosekov*, pp. 213–214.

Adult: Characterized by the following features. Frons comparatively broad, flat, without carinae, with longitudinal smooth line or groove in middle part of posterior half, and produced tubercle near antennal base. Antennae shorter than body, thicken slightly toward apex [*C. japonicus* (Chevr.)], rarely longer than body, thin [*C. gracilipes* (Fald.), male], contiguous at base; space between antennae less than distance between upper lobes of eyes. Pronotum laterally rounded, barely oblong or even transverse, disk uniformly convex, with dense punctation, and dense adherent and setaceous erect hairs. Latter entirely cover surface [*C. sexmaculatus* (Motsch.), *C. motschulskyi* (Ganglb.)] or only sides [*C. varius* (Müll), *C. ubsanurensis* Tsher., *C. diminutus* (Bat.)]. Elytra truncate at apex or with truncate sharp outer angle; as an exception rarely rounded (*C. motschulskyi chasanensis* Tsher., ssp. n.); with dark brown and light-colored adherent hairy coat forming characteristic pattern for each species, consisting of spots and transverse bands.

Larva: Distinguished by body moderately elongate. Half or more of head retracted into prothorax. Frontal sutures not visible. Epistoma not demarcated laterally, fuses with parietals. Antennae usually slender, comparatively long, and conspicuously extend beyond anterior margin of cephalic capsule. Ventral side with one hyaline convex ocellus near each antennal base. Ocelli in I-instar larvae with black pigmentation, which disappears in mature larvae. Anterior half of pronotal disk with two transversely elongate yellow spots that are sometimes notched on anterior margin, sides with one diffuse lustrous yellow spot. Thoracic legs present, small, poorly developed [*C. varius* (Müll.), *C. sexmaculatus* (Motsch.)], or absent [*C. diadema* (Motsch.)], or present in some insects, especially before pupation, and absent in others [*C. gracilipes* (Fald.)]. Locomotory ampullae moderately convex, developed on abdominal segments I to VII. Dorsal locomotory ampullae divided frontally by longi-
148 tudinal groove, with three grooves originating from it: one median longitudinal groove and two lateral divergent grooves.

Pupa: Body moderately elongate. Frons transversely coarse-rugose [*C. varius* (Müll.)], lustrous, rarely with short median transverse striation. Antennae flexed to sides, with apices directed backward [*C. japonicus* (Chevr.)] or turned toward middle [*C. gracilipes* (Fald.), *C. diminutus* (Bat.)].

Pronotum uniformly convex on disk, with scattered or haphazardly arranged bristles forming dense transverse median stripe; middle part of posterior slope always glabrous and lustrous. Abdominal tergites with sharp sclerotized spinules. Spinules on tergite VII larger, arranged in three to four transverse rows: spinules in hind row bent forward, in middle two rows bent inward, and in anterior row inward and backward.

At least 15 species of this genus are known in USSR fauna. In northern Asia 11 species have been recorded, of which four belong to the European-Mediterranean complex, one species [*C. gracilipes* (Fald.)] to Trans-Siberia, and five species to the Far East. *Chlorophorus ubsanurensis* Tsher. is presumably locally distributed. The fauna of south and southeast Asia and Japan is the richest in species composition. All species of the genus are ecologically associated with deciduous trees and shrubs. Only one species [*C. gracilipes* (Fald.)] moves (rarely) from deciduous trees to dead coniferous plants. This may be considered an ecological aberration, and not typical for this species.

Type species: Clytus annularis Fabricius, 1787.

KEY TO SPECIES

Adult Insects

1 (8). Elytra with dense light-colored (gray, greenish, or yellowish-green) hairy coat, imparting basic light-colored background on which pattern prominent in form of black spots and transverse bands.

2 (5). Dark pattern on elytra in form of crossbands. Pronotal disk with narrow black crossband.

3 (4). Black crossband in middle of elytra continuous, without light-colored hairy stripe on suture. Europe. Southern. Urals. . . . . 1. **C. varius** (Müll.).

4 (3). Black crossband in middle of elytra interrupted, divided by longitudinal light-colored hairy stripe on suture. Northern Mongolia (Ubsanur basin). . . . . 2. **C. ubsanurensis** Tsher.

5 (2). Dark pattern on elytra in form of spot. Pronotal disk with roundish or oval spot.

6 (7). Sides and disk of pronotum covered with dense erect hairs. Black spots on elytra longitudinally elongate. Eastern Asia. . . . . 3. **C. sexmaculatus** (Motsch),

7 (6). Sides of pronotum with dense and disk with stray erect hairs, Black spots on elytra transversely elongate. Europe, southern Urals. . . . . 4. **C. herbsti** (Brahm).

8 (1). Elytra with short dark brownish adherent hairy coat, imparting basic black or dark brown background on which pattern prominent in form of light-colored hairy spots and crossbands.

149 9 (16). Light-colored hairy band behind middle of elytra broadens on disk, narrows toward sides. Sides and disk of pronotum with erect setaceous hairs.

10 (11). Elytra apex truncate, with markedly produced, subulate outer angle. Kunashir Island, Japan. . . . . . 5. **C. japonicus** (Chevr.).

11 (10). Elytra truncate at apex, with minutely produced, at least not subulate outer angle.

12 (15). Humeral light-colored hairy spot reaches base of elytra, its length 3.0 times width. Light-colored crossband behind middle of elytra rhomboid, broadens angularly on suture, and extends toward front and apex.

13 (14). Elytra truncate at apex, with produced angles. Eastern Asia. . . . . 6a. **C. motschulskyi motschulskyi** (Ganglb.).

14 (13). Elytra rounded at apex, sometimes with produced outer angle. Khasan. . . . . . . 6b. **C. motschulskyi chasanensis** Tsher., ssp. n.

15 (12). Humeral light-colored hairy spot does not reach base of elytra, its length only 1.5 to 2.0 times width. Light-colored crossband not rhomboid behind middle of elytra, broadens angularly on suture, extends only toward front, and with straightly truncate back side. Europe, southern Urals. . . . . . 7. **C. figuratus** Scop.

16 (9). Light-colored hairy band behind middle of elytra barely broadens on disk, sometimes narrows, extends only toward front. Sides of pronotum with stray, sparse, erect setaceous hairs, disk without them.

17 (18). First segment of hind tarsi not longer than remaining segments together. Eastern Asia. . . . . 8. **C. diadema** (Motsch.).

18 (17). First segment of hind tarsi significantly longer than remaining segments together.

19 (20). Humeral white hairy spot present on elytra. Antennae long, extend beyond apex of elytra (male) or each posterior slope (female). Northern Asia, partly European part of the USSR. . . . . 9. **C. gracilipes** (Fald.).

20 (19). Humeral white hairy spot absent on elytra. Antennae not very long; extend beyond posterior white crossband of elytra.

21 (22). Body very narrow, elongate, small. White spot behind humeral tubercle on elytra absent. Eastern Asia. . . . . 10. **C. diminutus** (Bat.).

22 (21). Body not narrow, moderately thick. Marginal white spot behind humeral tubercle present on elytra. Europe, the Urals, Siberia. . . . . 11. **C. sartor** (Müll.).

Larvae

1 (6). Dorsal locomotory ampullae well expressed not only on back side, but also toward front of transverse groove. Epistoma convex in middle, similar to tubercle.

2 (3). Dorsal locomotory ampullae on abdominal tergites I to III with one, on tergites IV to VII with two indistinct transverse grooves. Found on broom, maple, Russian olive, and other deciduous trees. . . . . 1. **C. varius** (Müll.).

3 (2). Dorsal locomotory ampullae on abdominal tergites I to VII with one distinct transverse groove.

150 4 (5). Dorsal locomotory ampullae (especially on abdominal tergites IV to VII) with an additional oblique groove on disk originating from the outer anterior corner backward toward the middle. Predominantly found on hawthorn, maple, and pear. . . . . 3. **C. sexmaculatus** (Motsch.).

5 (4). Dorsal locomotory ampullae without additional oblique groove. Predominantly found on choke-cherry, linden, birch. . . . . 4. **C. herbsti** (Brahm).

6 (1). Dorsal locomotory ampullae distinct only behind transverse groove. Latter shifted toward anterior margin.

7 (8). Epistoma on anterior margin near clypeus with slight notch or none, truncate toward sides, transversely rugose in region of brownish border. Predominantly found on birch, rarely on aralia and other deciduous trees. . . . . 5. **C. japonicus** (Chevr.).

8 (7). Epistoma on anterior margin near clypeus and along sides with distinct notches, in region of brownish border smooth and lustrous, without transverse wrinkles.

9 (12). Abdomen laterally, near locomotory ampullae, and in middle (in pleural area) covered with dense hairs.

10 (11). Hairy cover on pronotum and presternum sparse. Gular plate usually longer than wide. Found on deciduous trees. . . . . 6a. **C. motschulskyi motschulskyi** (Ganglb.).

11 (10). Hairy cover on pronotum and presternum dense. Length of gular plate not more than width. Found on oak. . . . . 6b. **C. motschulskyi chasanensis** Tsher., ssp. n.

12 (9). Abdomen laterally, near locomotory ampullae, and in middle (in pleural area) with sparse, sometimes stray hairs.

13 (14). Dorsal locomotory ampullae with deep additional longitudinal groove on disk. Predominantly found on pseudoacacia. . . . . 8. **C. diadema** (Motsch.).

14 (13). Dorsal locomotory ampullae without deep additional longitudinal groove on disk, but with alveolar depression, rarely

with additional groove; if latter present, dorsal locomotory ampullae of tergite VI laterally with longitudinal oval structure.

15 (16). Dorsal locomotory ampulla on abdominal tergite VI without oval structure laterally. Predominantly found on deciduous trees, as an exception on conifers. . . . . 9. **C. gracilipes** (Fald.).

16 (15). Dorsal locomotory ampulla of abdominal tergite VI laterally with oval longitudinally elongate structure (at place of lateral grooves). . . . . 10. **C. diminutus** (Bat.).

Pupae

1 (2). Frons with coarse transverse wrinkles. . . . 1. **C. varius** (Müll.).

2 (1). Frons smooth, lustrous, without coarse transverse wrinkles, only sometimes with short transverse striation forming longitudinal stripe in middle.

3 (14). Antennae short, flexed to sides, with apices directed backward.

4 (5). Head before eyes with distinct crossband; genae parallel. . . . . 3. **C. sexmaculatus** (Motsch.).

5 (4). Head before eyes without crossband; genae narrow toward front.

151 6 (7). Metanotum broadly rounded on posterior margin; in any case not angular here. . . . . .4. **C. herbsti** (Brahm).

7 (6). Metanotum distinctly angular on posterior margin and here with distinct medial projection.

8 (9). Frons on anterior margin with three to four bristles along sides forming transverse row. . . . . 5. **C. japonicus** (Chevr.).

9 (8). Frons on anterior margin laterally with stray bristles that do not form distinct transverse row.

10 (13). Spinules on tergite VII very large, 2.0 to 4.0 times larger than spinules on abdominal tergite VI.

11 (12). Pronotum laterally with stray bristles in posterior half that do not form longitudinal stripe. . . . . 6a. **C. motschulskyi motschulskyi** (Ganglb).

12 (11). Pronotum with numerous bristles along sides of posterior half forming distinct longitudinal stripe. . . . . 6b. **C. motschulskyi chasanensis** Tsher., ssp. n.

13 (10). Spinules on tergite VII small, not larger than spinules located on abdominal tergite VI. . . . . 8. **C. diadema** (Motsch.).

14 (3). Antennae comparatively long, flexed to sides, with apices bent ventrad.

15 (16). Bristles on pronotum piliform, thin. Spinules on abdominal tergites II to V large, numerous, and directed backward. . . . . 9. **C. gracilipes** (Fald.).

16 (15). Bristles on pronotum acicular, thick. Spinules on abdominal tergites II to V dotlike, few, and almost erect. . . . . 10. **C. diminutus** (Bat.).

1. **Chlorophorus varius** (Müll.)

Müller, 1766, *Mélang. Soc. R. Turin*, 3, 1, 88 (*Leptura*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 461–464; Grechkin, 1951, *Ocherki po biologii vreditelei lesa*, p. 130; Mamaev and Danilevskii, 1975, *Lichinki zhukov-drovosekov*, p. 214.

Adult (Figure 86): Differs from other species in convex and markedly narrow pronotum toward front, presence of dense yellow hairy cover constituting general background, on which characteristic black alveolate pattern distinct. Head with fine punctation, dense adherent yellow hairy cover, only on lower side with long erect light-colored setaceous hairs. Frons barely broadens toward front, with faint border on sides, sometimes with narrow smooth median longitudinal stripe. Vertex slightly depressed, with median longitudinal groove that converts toward front into region of frons between antennae. Antennal apices reach beyond middle of elytra (male) or short of it (female). Third antennal segment equal to 5th, notably longer than 4th, and barely shorter than 1st.

Pronotum laterally rounded, broadens behind middle, narrows more toward anterior and less toward posterior end, with narrow transverse groove posteriorly, narrow produced anterior and posterior margins, disk hemispherical, convex behind middle, slopes smoothly toward front, abruptly toward back side, with dense adherent hairs; sides with black, sometimes distinct aristate spots (bristles light colored, piliform), disk with transverse black stripe with three round black spots forming transverse row. Scutellum rounded, narrows from posterior margin toward anterior end, rounded posteriorly, and with dense adherent hairs.

152 Elytra very convex, with parallel sides (female), or narrow slightly toward apex (male), with rounded humeri, small longitudinal depression near humeri, with obliquely truncate apex, slightly produced acute outer and obtuse or rounded inner angle; with fine dense punctation, dense adherent hairy coat forming pattern of black spot and crossbands on general yellowish background: large C-shaped spot near base that joins humeral spot toward front; broad black crossband in middle that is slightly extended along suture; narrow or comparatively broad band before posterior slope (f. *typica*). Sometimes ends of anterior C-shaped spot join, forming continuous broad black ring (ab. *ocellatus* Vit.), rarely spot joins middle black band on sides (ab. *kanabei* Heyr., ab. *paulojunctus* Pic) or broadens into continuous black background in anterior half of elytra, with isolated light-colored spot on it (ab. *fontanae* Hubent.); very rarely black background replaced by yellow background with isolated spots retained (ab. *supertomentosus* Plav.). Femora of male reach

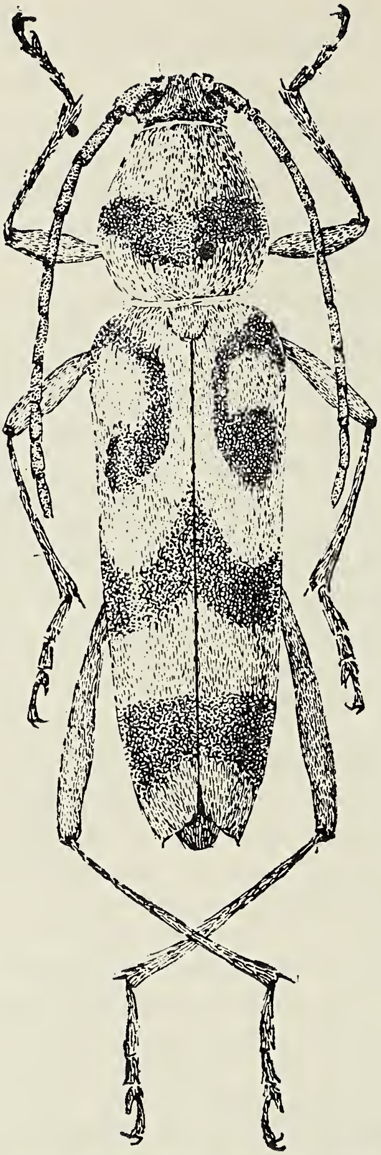


Figure 86. *Chlorophorus varius* (Müll.).

beyond elytral apex, in female barely reach it. Body ventrally with very dense adherent yellowish hairy coat, and semierect setaceous light-colored hairs. Abdominal sternites without glabrous smooth black border on posterior margin. Body, antennae, and legs black. Hairs cover yellowish, yellowish-green, or grayish, rarely gray; hairs on black band and black spots black or brownish-black. Sometimes antennae and legs rusty, with lighter-colored tinge. Boby length 8.0 to 14.0 mm.

Egg: White, in time acquires brownish tinge, elongate, usually narrower at one end, broadly rounded at anterior pole, narrowly, sometimes acutely rounded at posterior pole. Chorion smooth, lustrous, transparent. Length 1.5 mm, width 0.5 mm.

Larva (Figure 87): Distinguished from other species of *Chlorophorus* Chevr. by indistinct notch on anterior margin of epistoma, presence of transverse groove on dorsal locomotory ampullae not only at anterior, but sometimes also posterior margin, both of which are usually poorly developed. Half of head retracted into prothorax; head narrows toward front. Epistoma slightly convex, lustrous, with insignificant notch on anterior margin near clypeus, with brownish border that is diffuse toward back side; anterior half with long setaceous hairs forming transverse row. 153 Frontal and median sutures not visible. Hypostoma slightly convex, with transverse coarse wrinkles, narrows slightly toward front, with roundish anterior outer angles, anterior margin without visible border; if latter present, then very narrow; anterior half of each sclerite with three to five bristles forming transverse row. Gular plate flat, with parallel sides or narrows slightly toward front, anterior margin without

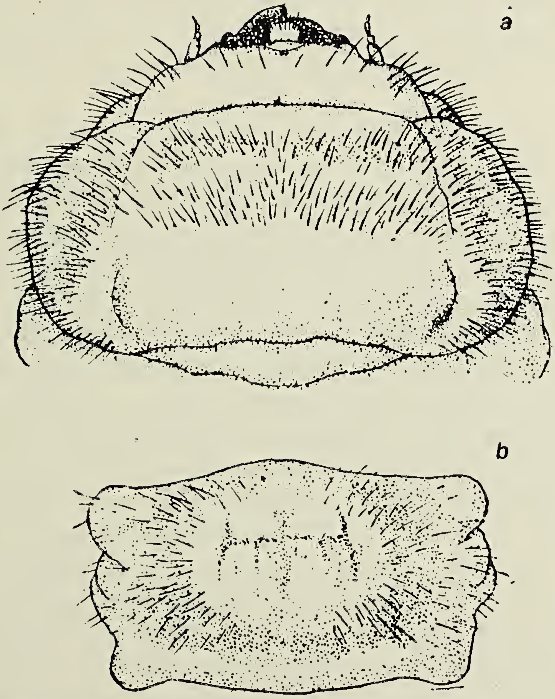


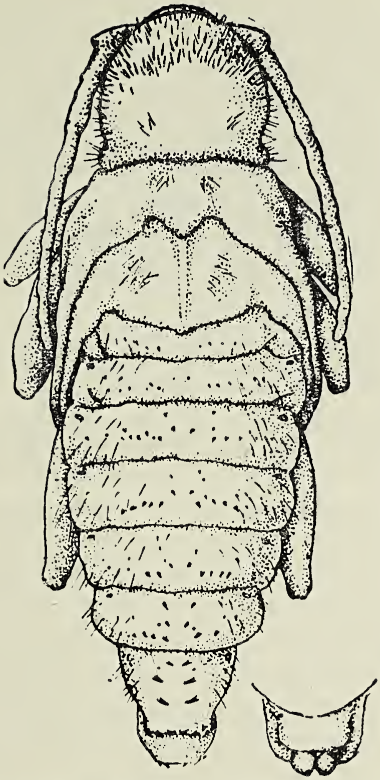
Figure 87. Larva of *Chlorophorus varius* (Müll.).
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

border, posterior margin usually with narrow rusty border. Parietals with rusty border on anterior margin that does not cover back side of orbital-antennal area, behind which transverse field before middle covered with widely separated setaceous hairs between hypostoma and epistoma. Antennae comparatively long, smooth, and very small. Clypeus short, widely flattened at base, and with brownish tinge. Labrum convex, with brownish tinge, broadly rounded anteriorly, with long brownish bristles along margin. Mandibles black, reddish-brown at base and here with transverse groove, broadly rounded at apex. Labial mentum slightly narrower or with parallel sides toward front. Sides with long bristles forming small group. Inner masticatory lobes of maxillae brownish, lustrous, apically truncate and whitish, with short light-colored bristles, and barely shorter than maxillary palps.

Pronotum laterally rounded, with two narrow transverse yellowish-rust spots in anterior third, with longitudinal dull yellow glabrous spot on disk, and laterally with uniform rusty hairs. Pronotal shield white, convex, sides with deep longitudinal folds, without distinct median longi-
154 tudinal groove, and without visible wrinkles, anterior margin straightly truncate, slightly produced forward only medially. Presternum with long uniformly dense rusty hairs. Eusternum glabrous, lustrous, without visible wrinkles. Thoracic legs poorly developed, look like very small chocolate-brown processes under high magnification, and not visible in some specimens.

Abdomen laterally with long rusty hairs forming common cover that continues almost up to median line on dorsal and ventral sides. Dorsal locomotory ampullae convex, sides with longitudinal curved fold that joins in front with transverse barely perceptible groove, from which short longitudinal groove originates backward in middle, and sometimes on back side joins with second transverse and indistinct groove; disk sometimes with longitudinal depression and minute longitudinal streaks. Ventral locomotory ampullae slightly transversely elongate, with median longitudinal depression, very narrow transverse groove, laterally with short longitudinal folds, and covered with slight longitudinal wrinkles. Length of mature larva up to 20 mm, width of head up to 2.8 mm.

Pupa (Figure 88): Differs from pupa of *C. herbsti* (Brahm) in longer femora which, in female, extend beyond apex of tergite V, and multiple bristles on anterior slope of pronotum. Head elongate toward front, markedly bent, with median longitudinal, transversely patterned stripe that extends from frons to vertex and from here to occiput; almost not depressed in region of clypeus and vertex; with four reddish-rust bristles laterally behind antennal base forming group; sides toward front of antennae with stray paired bristles. Antennae flexed to sides, apices extend only beyond abdominal tergite I.



153 Figure 88. Pupa of *Chlorophorus varius* (Müll.), female.

Pronotum slightly longer than maximum width, narrows more toward front and less posteriorly, with narrow transverse groove, disk broadly convex and smooth, with piliform bristles forming dense crossband in middle, and small group on posterior slope before posterior angles, large longitudinal field on anterior slope that spreads from crossband up to anterior margin of pronotum; posterior slope glabrous and lustrous in middle. Mesonotum slightly convex, on back side with angularly produced scutellum, and minute bristles laterally forming small group. Metanotum with longitudinal groove in middle, with scattered minute rusty bristles laterally.

Abdomen narrows slightly toward anterior end, markedly toward posterior end. Abdominal tergites with narrow median longitudinal groove, posterior half with acute large spinules directed backward forming straight or irregular row; two large spinules (near longitudinal groove) ahead of this row and four to five smaller spinules on each side of larger ones form middle transverse row; anterior half with two large widely separated spinules forming anterior transverse row. Abdominal tergites

I to II with only one row of spinules. Tergite VII narrows posteriorly, rounded or with straightly truncate posterior margin, and here with six to seven large spinules bent forward or erect; two pairs of large spinules bent toward each other ahead of these spinules form two transverse rows; anterior half with two to four minute spinules closer to anterior margin, forming anterior transverse row. Tergite VIII transverse, with three to six minute spinules on posterior margin. Abdominal sternites with minute bristles laterally. Valvifers of female hemispherical, apically smooth, highly contiguous at base. Body length 12 to 16 mm, width up to 4.0 mm.

155 *Material*: Collected in the southern Urals. Adult insects 97, larvae 55, pupae—four females, larval and pupal exuviae with beetles from pupal cells three.

Distribution: West and eastern Europe, Asia Minor. Coast of Atlantic Ocean to the Urals, north from Sweden south to the Mediterranean Sea. Found in large numbers in forests of the southern Urals.

Biology: Inhabits forest plantations of the southern Urals. Comparatively large numbers sighted. Beetles emerge predominantly in July. In 1978 the first beetles appeared on flowers in the Urals on July 4th and in large numbers mid-July. Often found on flowers of Umbelliferae, Asteraceae, Rosaceae, and other plants. Reproduction commences after feeding on flowers. Beetles survive up to two to three weeks, individual insects up to four weeks. Live on deciduous trees and shrubs. Ovaries of one female prior to oviposition contained 28 mature eggs, of another 24. Eggs laid singly in bark crevices in undergrowth as well as trunks of mature trees, predominantly in lower zone. Egg development continues for a little more than two weeks. In a forest under a tree canopy larvae hatched in 14 to 17 days, average 15 days, after oviposition at 22.4°C.

Larvae of early and middle instars live under bark, make longitudinal galleries from bottom upward, deeply impressed in wood, and fill them with compact fine frass. Galleries sometimes meandering, sometimes fuse, and form continuous layer of frass, terminating under bark. Mature larvae move deeper into wood, and in upper layer at a depth up to 3.0 cm or in pith (in small undergrowth, on shrubs) make longitudinal galleries, filling them with frass. End of gallery hollow, not filled with frass, and pupal cell made here with falcate outlet cut at anterior end toward surface. Cell usually filled with fine frass. Layer of wood 1.0 to 2.0 mm thick remains between outlet and bark. Length of gallery under bark 13 to 20 cm, in wood up to 14 cm, and width 6.0 to 9.0 mm. Length of pupal cell 2.4 to 7.5 cm, width 6.0 to 8.0 mm. Length of outlet from pupal cell 10 to 30 mm. Larva pupates in cell with head facing exit.

Pupation in June and early July. Maximum pupae found at end of

June. Pupal development continues for two weeks or a little longer. For example, a larva pupated on July 4th and the beetle emerged on July 18; in another case a larva pupated July 7th and the beetle emerged July 20, i.e., pupal stage in both cases continued for about two weeks. Atmospheric temperature during this period ranged from 13.8°C in the morning to 32.2°C later in the day, average 21.9°C. Emergence of young beetles begins in June and continues up to mid-July. Young beetles remain in pupal cell for about a week, after which they cut round openings (3.5 to 5.0 mm in diameter) on surface of bark and emerge from wood. Emergence of beetles from wood completed by end of July. In July pupae, beetles, and middle-aged larvae remaining for hibernation are found in wood, indicating that the complete cycle of development requires at least two years. Weight records of 24 individuals revealed that larvae before pupation vary in weight from 56 to 218 mg, pupae 50 to 189 mg, and young beetles before emergence from wood 45 to 147 mg.

Chlorophorus varius (Müll.) inhabits the basal zone of thin branches of undergrowth (0.8 to 2.5 cm in diameter near root collar) and thick trunks 20 cm or more in diameter. It lives only on deciduous trees. We raised 24 beetles from larvae collected in forests: 14 from broom, three each from maple and Russian olive, one each from oak, apple, and
156 blackthorn, and one from aspen. *Deilus fugax* Oliv. lives together with this species and *Chlorophorus herbsti* (Brahm) in the upper zone of branches of broom. This species often develops on other trees, however.

2. **Chlorophorus ubsanurensis** Tsher.

(Tsherepanov) Cherepanov, 1971, *Nov. i maloizv. vidy fauny Sibiri*, 4th ed., pp. 14–16.

Adult (Figure 89): Close to *C. varius* (Müll.). Differs in minimum body size, pattern on elytra, and other characters. Frons flat, broadens toward front, sides with barely expressed edge, with dense punctation, not very dense gray adherent hairs, small produced tubercles near antennal base, and posterior half with median longitudinal groove that converts into vertex on back side. Vertex flat, with large punctation and sparse gray hairs. Eyes large, distinctly faceted, smoothly and broadly notched. Antennae extend beyond first third of length of elytra, thicken slightly toward apex, with minute gray adherent hairs; lower side of 2nd to 5th segments with light-colored hairs. Fifth antennal segment slightly longer than 4th and distinctly shorter than 3rd.

Pronotum slightly longer than wide, smoothly rounded laterally, not narrower anteriorly; disk convex in posterior half, slopes gradually toward front and abruptly toward posterior margin, with bent margin at both posterior and anterior ends, dense punctation, convex part with

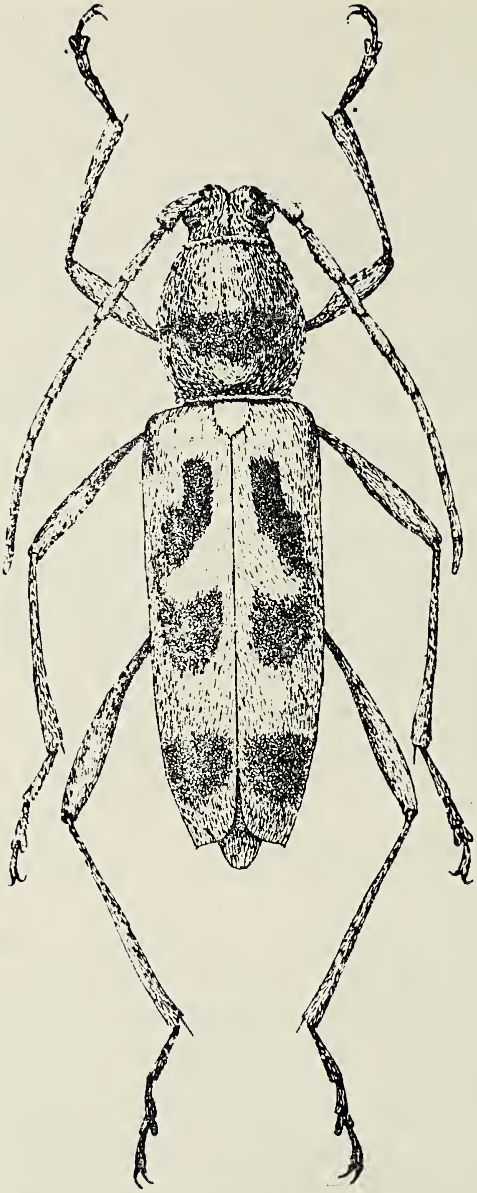


Figure 89. *Chlorophorus ubsanurensis* Tsher.

large rugose punctation, smooth and compactly adherent gray hairs, with black aristate dots posterolaterally, on disk with black longitudinal stripe behind middle and here with dark brown adherent hairs. Scutellum slightly convex, narrowly rounded anteriorly, and with dense, compactly adherent light gray hairs.

Elytra with parallel sides, disk sufficiently convex, with rounded humeri, shallow longitudinal notch on inner side of humeral tubercles,
157 and suture with short depression behind scutellum, truncate at apex, with sharp outer and rounded inner angle, with fine very dense punctation, dense adherent light gray and dark brown hairs forming pattern of black spots and bands on general light gray background: small black spot on humeral tubercle; broad longitudinal notched spot shifted toward sides in posterior half in anterior third; anteriorly broad, backwardly curved crossband behind middle and posterior broad crossband, located on posterior elytral slope do not reach suture. Legs slender; femora thin slightly and gradually in second half; hind tarsi slender, comparatively long, 0.66 length of tibiae. First segment of hind tarsi barely longer than other segments together. Body ventrally with dense adherent light gray hairy cover (hairy cover slightly sparser only at base), with semiadherent light-colored setaceous hairs. Body black, with brownish tinge, tarsi dark rust. Length 7.0 mm.

This species is similar to *C. varius* (Müll.) in absence of erect hairy cover on pronotal disk and arrangement of crossband in middle, but differs conspicuously in pattern of elytra and other characters.

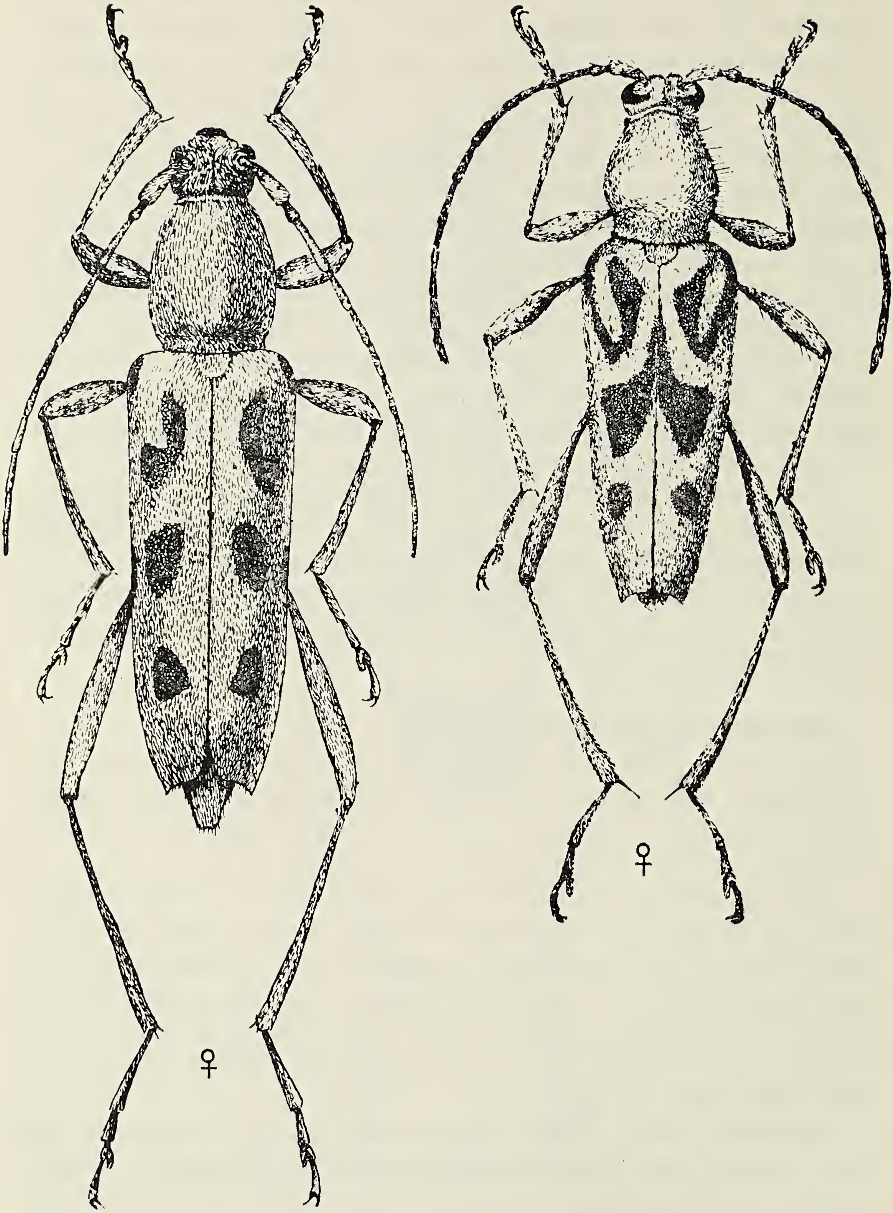
Material: Collected in Ubsanur basin, on northern bank of Lake Ubsa-Nur. Adult insect, one female (holotype). Larvae and pupae not known. Biology not known.

3. **Chlorophorus sexmaculatus** (Motsch.)

Motschulsky, 1859, *Bull. Soc. Nat. Moscou*, 32, 9, 494 (*Clytus*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 464–466; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 83; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed., pp. 41–42.

Adult (Figure 90 a, b): Differs from other species of *Chlorophorus* Chevr. in shape and arrangement of black glabrous spots on elytra. Head with fine dense punctation, adherent hairs forming continuous cover, and along sides of frons near antennal base with produced tubercle. Eyes with broad and shallow notch. Antennal apices barely reach middle of elytra (male) or do not reach (female). Third antennal segment longer than 4th, equal to 5th.

Pronotum oblong, usually narrows more toward anterior end, less toward posterior end, broadly rounded laterally, with narrow transverse groove posteriorly, barely bent anterior margin, disk more convex (tubercular) before posterior slope, flattens gradually toward front, with very fine punctation, dense greenish adherent and long erect thin hairs, and small black spots: one spot on disk and one each side (f. *typica*). Sometimes spots present only on sides or only on disk, sometimes completely absent (ab. *unicoloricollis* Plav.). Scutellum convex, narrows



158 Figure 90. *Chlorophorus sexmaculatus* (Motsch.).
a—forma *typica*; b—ab. *circularis* n., female.

roundly anteriorly, narrowly rounded posteriorly, and with dense adherent hairs.

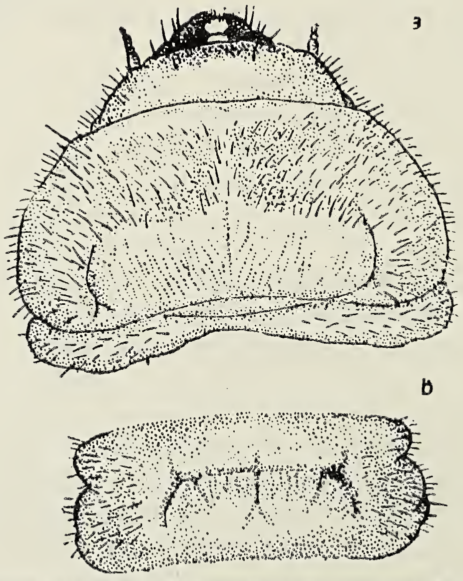
Elytra with parallel sides, convex, with rounded humeri, deep oblique longitudinal notch on inner side of humeri, broadly truncate apically, with acute, spinelike, produced outer angle and rounded inner angle, with very fine and dense punctation; dense compactly adherent hairs form characteristic pattern of black spots that are prominent against general green hairy background (one C-shaped spot extends along suture near base; second, median spot, longitudinally elongate, sometimes notched toward front or, contrarily, along suture markedly extended toward front; third spot oval, longitudinally elongate or almost round,
158 located before posterior slope; and fourth small spot located on humeral tubercle). All these black spots are covered with fine adherent brownish or black hairs (f. *typica*). Sometimes second (in middle) and third (before posterior slope) spots divided longitudinally into two spots each (ab. *duplicatus* Plav.), or second (middle) spot forms band that extends forward along suture, and first (C-shaped) spot merges with humeral spot to form longitudinally elongate closed circle (ab. *circularis* n.). Latter aberrant form highly resembles *C. annularis* (F.) and is found in southeast Asia. Legs long, hind femora extend beyond elytral apex (male) or slightly shorter (female). First segment of hind tarsi longer than all successive segments together. Body ventrally with continuous cover of dense, compactly adherent, greenish hairy coat, and with semierect long thin light-colored hairs. Abdominal tergites with narrow lustrous glab-
159 rous notch on posterior margin. Hairy cover greenish, rarely with grayish tinge. Body length 9.0 to 17.0 mm.

Egg: White, moderately elongate, rounded on poles. Chorion translucent, smooth, without visible sculpture. Length 1.8 mm, width 0.6 mm.

Larva (Figure 91): Head barely narrower toward front. Epistoma depressed at apex, uniformly convex toward front, on anterior margin near clypeus with narrow notch and dark brown, transverse, thin, patterned border, at apex with short median longitudinal suture. Frontal sutures not visible. Hypostoma slightly convex, lustrous, with faint transverse wrinkles, rounded anterior outer angles, anterior half with three to four, sometimes in middle part two to three, long bristles forming one or two transverse rows. Gular plate trapezoid, oblong. Parietals with sparse hairs in anterior half, anterior margin near hypostoma (on lower side of antennae) with brownish border, and with one indistinct hyaline ocellus. Antennae long; 2nd antennal segment extends beyond anterior margin of cephalic capsule. Inner masticatory lobes of maxillae broad, whitish, broadly rounded at apex, and with short bristles. Maxillary palps not longer than inner lobes. Clypeus small, trapezoid, translucent, whitish or with brownish tinge. Labrum small, roundly convex, with short brownish bristles. Mandibles broadly rounded at apex, with broad notch on outer side near base.

Pronotum laterally rounded, slopes significantly toward head, with two transverse spots in anterior third, sides with one lustrous longitudinal oval yellow spot before scutellum. Pronotal shield convex posteriorly, bound laterally by straight longitudinal deep folds, divided by narrow median longitudinal groove, white, lustrous, with minute longitudinal wrinkles. Presternum with uniform dense and rusty hairs on disk and sides. Eusternum glabrous, leathery, lustrous, smooth. Thoracic legs in some insects (especially before pupation) very distinct, in others barely perceptible. In some larvae legs in form of small, barely sclerotized spinules.

Abdomen narrows slightly from thorax toward posterior end, laterally with short rusty hairs forming sparse cover that extends onto sides of locomotory ampullae. Dorsal locomotory ampullae moderately convex, leathery, rugulose, divided by transverse groove toward front from which three longitudinal grooves originate—one medial, two lateral—and one additional groove from anterior outer angles directed obliquely backward and inward. Ventral locomotory ampullae transversely elongate, with median channel-shaped longitudinal depression, divided by transverse groove that joins lateral longitudinal fold, leathery, with small, sometimes faint wrinkles. Body length of mature larvae up to 26 mm, width of head 3.0 mm.



160 Figure 91. Larva of *Chlorophorus sexmaculatus* (Motsch.). a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

Pupa (Figure 92): Head elongate toward front, narrow, transversely barely convex between antennae, on vertex and before clypeus more (male) or less (female) depressed, with elongate margin laterally near antennae; vertex with three to four bristles behind antennae, sides of frons with pair of short bristles on anterior margin. Antennae flexed to sides, apices directed backward.

Pronotum longitudinal, with almost parallel sides, sometimes narrows slightly toward front, with transverse groove near posterior end, slopes uniformly toward anterior margin, and convex on disk; thin piliform
160 bristles form dense continuous median transverse belt, group on sides before posterior angles, scattered sparse field in anterior half, and more or less definite crossbands on anterior margin.

Mesonotum slightly depressed behind middle, with faint sparse transverse streaks, insignificantly produced scutellum on posterior mar-

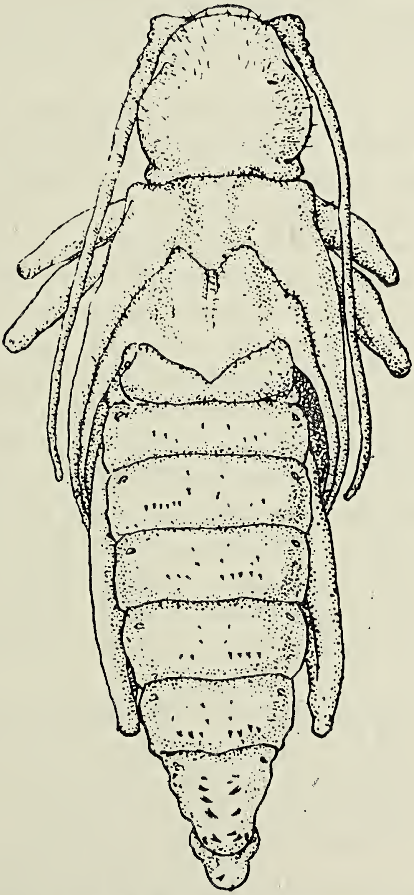


Figure 92. Pupa of *Chlorophorus sexmaculatus* (Motsch.)

gin, with barely visible bristles along sides forming single group. Metanotum convex, lustrous, smooth, with barely perceptible median longitudinal groove, and stray minute bristles on sides or without them.

Abdomen broadens in region of segments IV to V, narrows markedly toward posterior end. Abdominal tergites convex, with narrow median longitudinal groove, posterior half with acute dark brown spinules directed backward and forming distinct transverse row; each tergite with one spinule located ahead of this row on each side of longitudinal groove, which bend toward each other; sometimes anterior half with two to four spinules on each tergite forming transverse row. Tergite VII elongate, longitudinal, posterior margin with four to six large spinules bent forward, anterior part with two pairs of transversely scattered spinules bent toward each other. Tergite VIII broadly rounded posteriorly, posterior margin with four acute large spinules bent inward and forward. Valvifers of female hemispherical, with small lateral tubercles apically. Hind femora apically reach beyond abdominal tergite V (male) or fall slightly short of it (female). Body length 14 to 16 mm, width of abdomen up to 4.0 mm.

Material: Collected in Ussuri-Primor'e region, and Sakhalin and Kunashir Islands. Adult insects 337, larvae 42, pupae—six males and females, larval exuviae with beetles from pupal cells 21.

161 *Distribution*: Amur basin, Ussuri-Primor'e region, Sakhalin and Kunashir Islands; northeast China, Korean Peninsula, Japan.

Biology: Lives in forests of the Far East, inhabiting deciduous plantations. Beetles emerge from mid-June to mid-August, but found in small numbers in first 10 days of July. For example, during systematic collections for two seasons (in Ussuri-Primor'e region, Kobarovka River) we caught 191 beetles: 2.1% in second half of June, 12.6% in first half of July, 61.8% in second half of July, and 23.5% in first half of August. Beetles visit flowers of meadowsweet (*Spiraea*), pseudospiraea, many Umbelliferae, Asteraceae, and other plants, and then fly to trees where development takes place. After mating female lays eggs in bark crevices or under residual shields of lichens, etc. Eggs are laid singly. One female can lay more than 60 eggs in her lifetime. Drying or recently dried trees of hawthorn, maple, walnut, and other deciduous trees are inhabited.

Egg incubation under laboratory conditions at an ambient temperature continued for 18 to 28 days, i.e., three to four weeks. In nature the largest number of eggs was recorded at the end of July. Hatching of larvae commences in July and terminates in first half of September. Larvae live in wood, make longitudinal meandering galleries in upper layer at a depth of 2.0 cm, and fill them compactly with fine frass. Length of gallery in wood up to 13 cm or more, width up to 9.0 mm.

After its second hibernation larva makes pupal cell at end of gallery, longitudinal to trunk in upper layer of wood, cuts an outlet up to bark, and fills it with frass. Length of pupal cell 25 to 31 mm, width 6.0 to 10.0 mm.

Pupation begins in late May or early June and terminates end of June or beginning of July, with the largest number appearing in second 10 days of June. Pupation continues for about three weeks. Young beetles begin to appear in second 10 days of June. Mass emergence of beetles observed in first 10 days of July and, five to six days later, fully hardened (developed) beetles cut through bark, make round opening (4.0 to 5.0 mm in diameter), and emerge from pupal cell. Beetles require supplementary feeding and begin to reproduce three to four days after their emergence from wood, by which time their gonads have matured. Weight changes during metamorphosis are nicely exemplified by a single individual: weight of larva ready for pupation 165.5 mg (100%), female pupa developed from it 149.8 mg (90.5%), weight of beetle soon after emergence from pupa 96.4 mg (58.6%), and weight prior to exiting from pupal cell 93.9 mg (56.7%). At this time the eggs in the ovarioles were still undeveloped. Ovaries of one mature female contained 66 eggs. Variability in weight of a population (based on records of 24 individuals) at different stages of development is comparatively high. Larvae before pupation 69.7 to 196.0 mg, pupae 63.6 to 178.0 mg, and young beetles before emergence from wood 43.5 to 149.8 mg. Generation completed in two years. Young larvae undergo first hibernation, and older larvae second (Table 9).

162 **Table 9. Periods of development of *Chlorophorus sexmaculatus* (Motsch.)**

Year of development	April	May	June	July	August	September	October
1st	L	LP	LPA	LPAE	AEL	EL	L
2nd	L	L	L	L	L	L	L
3rd	L	LP	LPA	LPAE	AEL	EL	L

Chlorophorus sexmaculatus (Motsch.) damages only deciduous trees. We raised 100 beetles from larvae collected in nature: 66 from hawthorn, 24 maple, four Manchurian walnut, two each Amur choke-cherry and pear, and one each from guelder rose and alder. In addition 49 larvae, pupae, and beetles were collected during an inspection of forests: 26 from hawthorn, 11 maple, six pear, two each Manchurian walnut and linden, and one each from alder and oak.

162 *Chlorophorus sexmaculatus* (Motsch.) inhabits thick (tree trunks) as well as thin branches (twigs) and destroys the wood. We once collected

30 pupae and adult insects from a trunk section 40 cm long and 5.5 cm in diameter. The trunk was riddled with larval galleries.

4. **Chlorophorus herbsti** (Brahm)

Brahm, 1790, *Ins. Kalend.*, vol. 1, p. 148 (*Leptura*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 466–468.

Adult (Figure 93): Close to *C. sexmaculatus* (Motsch.). Differs in shape of black spots on elytra, structure of frons, and other characters. Head notably narrower than pronotum. Frons suspended, with small dense punctation, dense adherent hairs smoothly directed backward, sides ribbed, as if edged, margin broadens in front [in *C. sexmaculatus* (Motsch.) anterolateral margins not ribbed], with produced tubercle on inner side near antennal base. Vertex depressed, with dense adherent hairs, and short median longitudinal groove. Occiput glabrous, with dense punctation. Antennal apices barely reach beyond middle of elytra (male) or short of it, with fine gray hairs. Third antennal segment equal to 5th, notably longer than 4th.

Pronotum oblong, its length notably greater than width, broadly rounded laterally, with narrow transverse basal groove [less distinct than in *C. sexmaculatus* (Motsch.)], uniformly convex disk, with dense adherent greenish hairy coat, long erect thin light-colored hairs, posterior half laterally with glabrous black dots, disk with large and sides small round glabrous black spots. Scutellum not longer than wide, broadly rounded anteriorly, and with dense adherent greenish hairs.

Elytra with parallel sides, convex, with rounded humeri, slight longitudinal notch on inner side [in *C. sexmaculatus* (Motsch.) notch deep and slightly oblique], truncate at apex, with spinelike produced outer and less produced inner angle, with fine dense punctation, dense smoothly adherent greenish hairy cover, with black spots prominent on background of hairy cover: one C-shaped, curves toward suture, located near base; second transversely elongate in middle of elytra; third transversely oval in posterior third [in *C. sexmaculatus* (Motsch.) these spots are longitudinally elongate]. Humeral tubercle with longitudinally elongate black spot. Body ventrally, as in *C. sexmaculatus* (Motsch.) entirely covered with dense adherent greenish hairy coat and numerous semierect or erect light-colored hairs. Hind femora barely reach (male) or do not reach (female) elytral apex. Body, antennae, and legs black, tarsi with rusty-
163 brown tinge. Body length 9.0 to 15.0 mm.

Egg: White, elongate, broadly rounded at anterior pole, pointed or narrowly rounded at posterior pole. Chorion smooth, without visible sculpture, translucent. Length 17 mm, width 0.6 mm.

Larva (Figure 94): Differs from the closely related species *C. sexmaculatus* (Motsch.) in structure of dorsal locomotory ampullae, and very

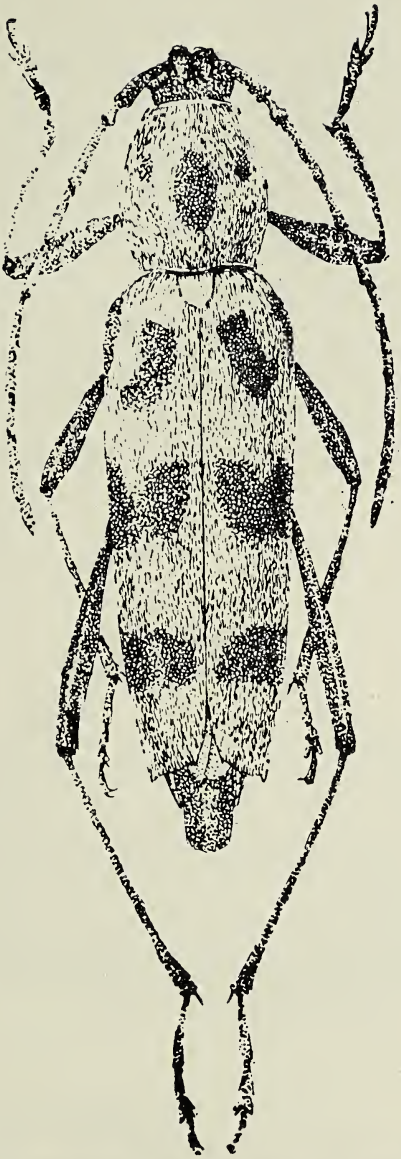
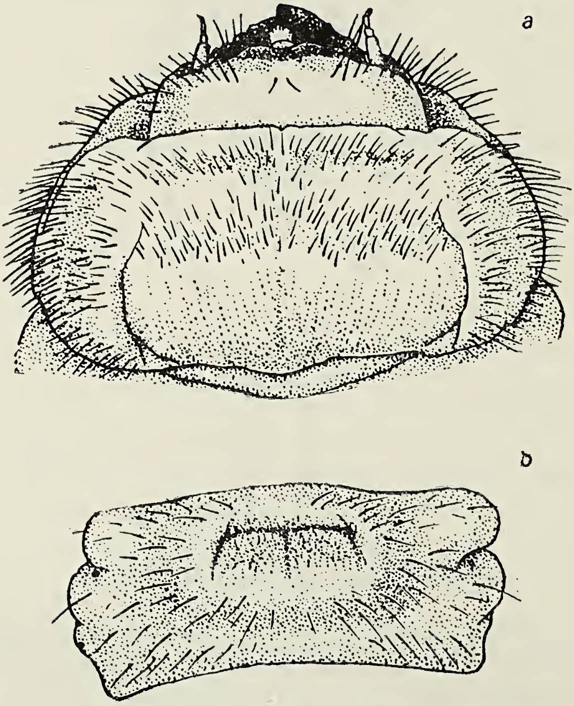


Figure 93. *Chlorophorus herbsti* (Brahm).

dense hairy cover on sides of abdomen. Head narrows slightly toward front. Epistoma notched on anterior margin near clypeus, with lustrous dark brown border, slightly convex in anterior half. Frontal sutures and median longitudinal sutures not visible. Hypostoma barely narrows toward front, with very narrow rusty border on anterior margin, behind which three to four small bristles form jumbled transverse row. Gular plate narrow, with parallel sides, slightly oblong, and whitish. Parietals in anterior half behind ocellus with long sparse hairs, brownish border on anterior margin ventral to antennae. Antennae comparatively long, 2nd to 4th segments brownish. Ocellus hyaline, convex, small, separated from antennal base by distance 2.0 its diameter. Clypeus short, flattened on sides, protrudes from behind epistoma in form of small strip, and with brownish tinge. Labrum small, transverse, convex, broadly rounded at apex, with short light-colored hairs, and whitish. Mandibles black, at base reddish-brown, on outer side closer to base broadly depressed. Labial mentum transverse, slightly narrower in anterior half, sides with long bristles forming group. Inner masticatory lobes of maxillae lustrous, much shorter than maxillary palps, and with long apical bristles.

Pronotum transversely oval, narrows slightly toward front, its anterior third with two barely protruding diffuse transverse yellowish spots, sides with one glabrous, lustrous, longitudinally elongate spot, and with dense rusty hairs on disk and sides before scutellum. Pronotal shield white, leathery, with two slight notches on anterior margin, almost transversely truncate, barely produced forward medially and here with



164 Figure 94. Larva of *Chlorophorus herbsti* (Brahm). a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

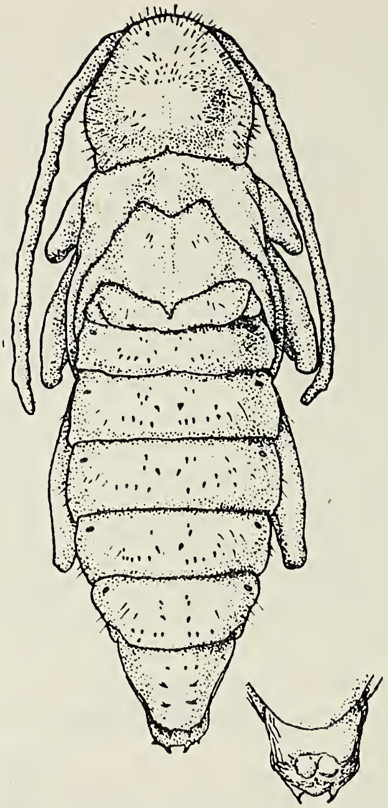
distinct longitudinal groove; sides with short longitudinal and slightly bent deep folds, with faint longitudinal streaks in anterior half. Prester-164 num with uniform dense rusty hairs on disk and sides. Eusternum glabrous, lustrous, with fine wrinkles. Thoracic legs barely noticeable, in form of small caruncles that do not protrude from hairy coat [in *C. sexmaculatus* (Motsch.) they are better developed and distinct].

Abdomen laterally with dense rusty hairy coat, which dorsally and ventrally covers sides of locomotory ampullae. Dorsal locomotory ampullae leathery, rugulose, toward front divided by transverse groove from which three longitudinal grooves originate backward: one in middle and two diverging along sides; additional groove originating from anterior outer angle backward and inward absent in this species [which distinguishes it from *C. sexmaculatus* (Motsch.)]. Ventral locomotory ampullae divided by median transverse groove joining laterally with alveolar depression or with short lateral longitudinal fold, and rugulose. Body length of mature larvae up to 20 mm, width of head 2.8 mm.

Pupa (Figure 95): Body moderately elongate. Head appears short, narrows markedly ahead of antennae, transversely convex between antennae, along sides of vertex behind antennal base with four bristles, on anterior margin of frons with short bristles forming transverse row, and occiput and vertex with median longitudinal whitish stripe. Antennae flexed to sides, with apices directed backward, and reach middle of abdominal tergite III.

Pronotum slightly longer than wide, narrows smoothly anteriorly, laterally rounded, with more (male) or less (female) distinct narrow transverse groove posteriorly, disk uniformly convex, posterior half with flat longitudinal notch laterally; thin rusty bristles form dense crossband in middle or immediately behind middle; more (female) or less (male) definite crossband on anterior margin; longitudinally elongate group 165 along sides of posterior slope, and sparse field (randomly scattered) in anterior half, where whitish median longitudinal line also occurs. Mesonotum longitudinally convex, with barely perceptible saddle-shaped depression behind middle, and with minute bristles along sides forming small group. Metanotum with channel-shaped median longitudinal groove and stray rusty bristles on sides.

Abdomen broadens equatorially more in female than in male, and notably narrows posteriorly. Abdominal tergites uniformly convex, with median longitudinal groove; sharp spinules before posterior margin form transverse row; ahead of row, immediately behind middle, pair of spinules along sides of longitudinal groove; anterior half with smaller spinules forming anterior jumbled transverse row, or with two small groups on each tergite (of two to three spinules on each side of longitudinal



164 Figure 95. Pupa of *Chlorophorus herbsti* (Brahm), female.

groove). Tergite VII comparatively elongate, narrowly rounded posteriorly; posterior margin with four to six spinules forming transverse row; ahead of this row, on disk, two pairs of large spinules bent toward middle form two transverse rows; anterior half with three to four small spinules forming anterior transverse row. Tergite VIII short, rounded at apex and here with two to three small spinules. Hind femora reach (male) or do not reach (female) posterior margin of tergite V. Abdominal sternites with small solitary bristles on sides. Valvifers of female hemispherical, narrow slightly toward base, smooth at apex, and uniformly rounded. Body length 14 mm, width of abdomen 3.5 to 4.0 mm.

Material: Collected in forests of the southern Urals. Adult insects 30, larvae 60, pupae—one male and two females, larval and pupal exuviae with beetles from pupal cells five.

Distribution: From Atlantic coast to the Urals, the Mediterranean, and southern Karelia. Abundant in the southern Urals.

Biology: Found in large numbers in broad-leaved forests of the southern Urals. Predominantly inhabits sparse areas, forest fringes, coppices along ravines, and banks of rivers and lakes. Emergence of beetles from end of June to end of August. Beetles maximum mid-July. They visit flowers of Umbelliferae, Rosaceae, Asteraceae, and other plants, feed there, then fly to trees inhabited by them. Gonads mature during supplementary feeding on flowers. Ovaries of one female collected from flowers contained 23 fully formed eggs, of another female (weight 52 mg) before beginning oviposition 44 eggs. Trees of different deciduous species are inhabited. Female lays eggs singly in bark crevices of drying and freshly dried trees, often on dried side of viable trees. Found more often on branches 2.0 to 5.0 cm in diameter. In an experiment under a forest canopy larvae hatched from eggs in 13 to 18 days, average 16 days, at 20.5°C.

Mature larvae more under bark, make longitudinal, sometimes meandering galleries (I-instar larvae make transverse and longitudinal galleries), deeply impressed in alburnum, and fill them compactly with fine white frass that dries into doughlike mass. When the bark is removed, frass remains in gallery on alburnum. Galleries made by larvae under bark have suspended or sharp edges. Mature larvae gradually move deeper into wood, make longitudinal galleries there in upper layer at a depth of up to 1.8 cm and in thin branches along pith, and fill them
166 with frass. They make pupal cell at end of gallery before second hibernation or in spring with the onset of warm weather, longitudinal to trunk, cut a transverse exit from anterior end of pupal cell up to bark, and fill it with frass. Gallery length up to 24 cm, width 6.0 to 8.0 mm. Length of pupal cells 26 to 43 mm, width 7.0 to 8.0 mm. Length of transverse outlet from pupal cell 9.0 to 28.0 mm.

Larvae pupate in May and first half of June. Pupal stage continues for two to three weeks. Under laboratory conditions, in an experiment at 18.7°C, one beetle emerged December 8th from a pupa formed November 23, i.e., 15 days later; in two other experiments, at the same temperature, beetles emerged after 24 days. Emergence of beetles from pupae terminates end of June or beginning of July. Beetles after discarding pupal exuviae acquire normal appearance in three to four days. They remain in pupal cell for five to six days, then cut round opening 3.0 to 4.0 mm in diameter on surface of bark and exit from pupal cell. Beetle emergence from pupal cells begins mid-June and ends in early July. They emerge from wood with immature gonads and require supplementary feeding. Ovaries of one female dissected after emergence from wood were underdeveloped, and the eggs in the ovarioles looked like minute thickenings. Beetle emergence terminates end of July or in early August. Generation completed in two years. First hibernation takes place at young larval stage, and second hibernation at mature larval stage (Table 10). Weight records of 27 individuals: larvae before pupation 43

Table 10. Periods of development of *Chlorophorus herbsti* (Brahm)

Year of development	April	May	June	July	August	September
1st	L	LP	LPAE	PAEL	AEL	L
2nd	L	L	L	L	L	L
3rd	L	LP	LPAE	PAEL	AEL	L

to 162 mg, pupae 41 to 150 mg, and beetles before emergence from wood 35 to 118 mg.

Changes in weight during metamorphosis are well illustrated by the following examples: weight of three larvae before preparation for pupation 407 mg (100%), after preparation for pupation 295 mg (51.5%); weight of four larvae ready for pupation 419 mg (100%), of pupae developed from them 382 mg (91.1%); and weight of two pupae 168 mg (100%), of beetles emerged from them 115 mg (68.4%) and after emergence from wood 105 mg (91.8%). Hence the weight of individuals decreased 48.5% during the period of preparation for pupation (mainly due to evacuation of the intestinal tract), 8.9% during pupation, 31.4% during development of beetles from pupae, and 8.7% during emergence of beetles from wood (relative to weight of each preceding stage). This indirectly indicates that the processes taking place in the organism during metamorphosis (histolysis and histogenesis) involve a high consumption of energy.

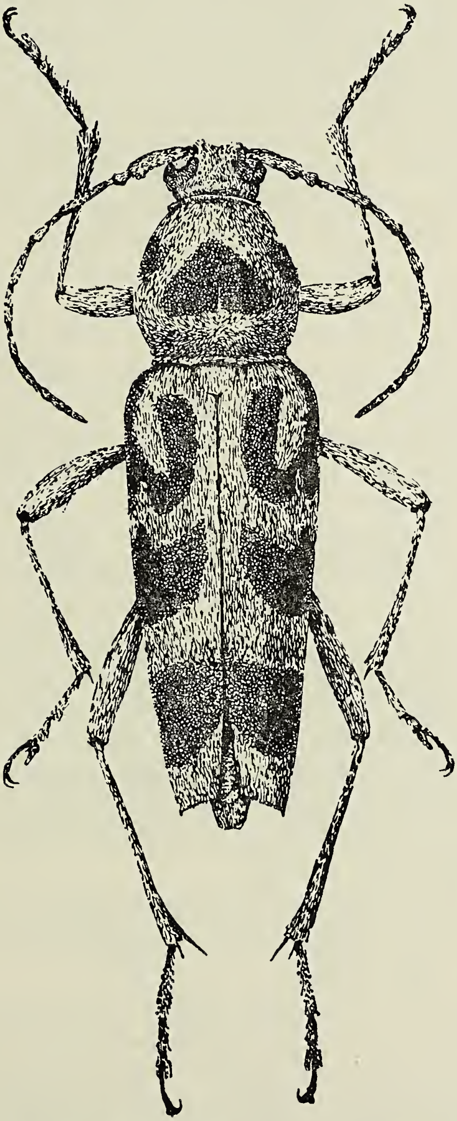
Chlorophorus herbsti (Brahm) damages trunks of undergrowth, and the apex and shoots of viable trees. It often inhabits drying twigs of growing trees. It attacks trees of different deciduous species. We raised 20 beetles from larvae collected from a forest in the southern Urals: eight from choke-cherry, five linden, four birch, two oak, and one from hawthorn. During the host-plant study larvae, pupae, and adult insects (total 60) were found: 22 on linden, 17 choke-cherry, 13 birch, six oak, and two on hawthorn.

167 There are indications that this species is also capable of developing on acacia, alder, mulberry, and grape. This species is found together with *Xylotrechus arvicola* (Oliv.) on the same trees; the former occupies the upper part of the trunk (above 1.0 m), and the latter the lower basal zone. *Chlorophorus herbsti* (Brahm) sometimes occupies branches damaged by larvae of *Rhopalopus clavipes* (L.).

5. **Chlorophorus japonicus** (Chevr.)

Chevrolat, 1863, *Mem. Soc. Sc. Liege*, vol. 23, p. 298 (*Anthoboscus*); Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 278. Kojima and Okabe, 1960, *Food Plants of Japan. Cerambycidae*, pp. 30–32; Kojima and Hayashi 1969, *Insect Life in Japan*, vol. 1, p. 82; Krivolutskaya, 1973, *Entomofauna Kuril'skikh ostrovov*, p. 105.

Adult (Figure 96): Differs from other species in thick body, markedly produced outer angle of elytral apex, and other characters. Body comparatively thick. Head short, retracted into prothorax almost up to eyes. Frons flat, with dense punctation, dense gray adherent hairs, middle part of posterior half with longitudinal smooth stripe or without it,



167 Figure 96. *Chlorophorus japonicus* (Chevr.).

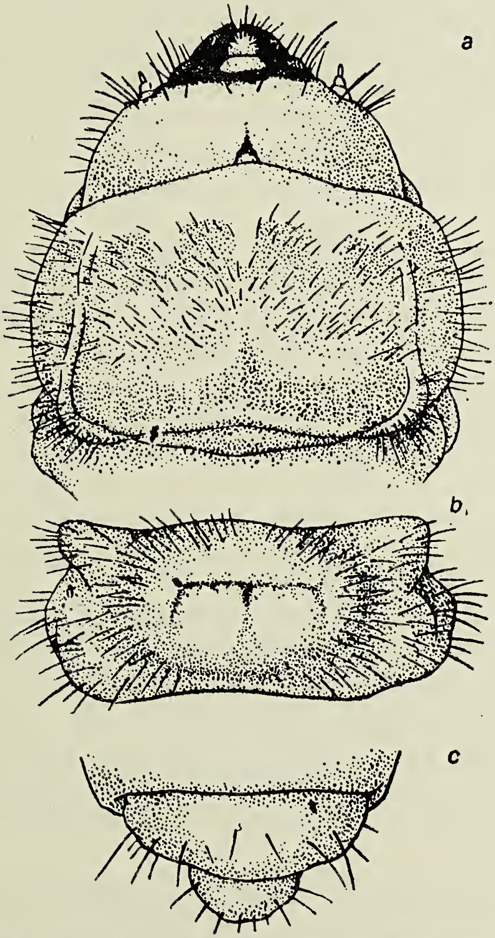
and with produced tubercle near antennal base. Body flat or slightly compressed, with gray adherent, not very dense hairs, and large black dots. Occiput glabrous, with dense minute punctation. Eyes large, convex, minutely faceted, and with narrow notch. Antennae comparatively short, with apices reaching (male) or not reaching (female) beyond anterior third of elytra. Third antennal segment barely shorter than 1st, notably longer than 5th.

Pronotum slightly longer (male) or less (female) than width, sides markedly (female) or retatively barely (male) rounded, narrows more anteriorly, less posteriorly and here with narrow transverse constriction; anterior margin with narrow curved border, uniformly convex on disk and with very dense uniform punctation, with short gray and brownish adherent hairs; disk with black spot, sides (especially in posterior half) with black large dots, only sides or entire surface with light-colored erect setaceous hairs. Scutellum slightly convex or flat, on back side angularly rounded, and with dense gray adherent hairs.

Elytra narrow notably toward apex, broadly truncate at apex, with very long produced outer and spinelike inner angle; disk convex,
168 with distinct longitudinal notch on inner side of humeral tubercle, slightly depressed on suture behind scutellum, with very fine dense punctation, dense short adherent brownish and white hairs, with pattern consisting of white spots and two crossbands. White hairy longitudinally elongate spot in humeral notch anteriorly joins scutellar border, converts into anterior white crossband on suture, bends laterally and here connected with lateral transverse spot located behind humeral tubercle. Second (posterior) crossband behind middle of elytra laterally less broad than at suture, extends forward along suture and partly backward, and broadens here. Elytral apex with broad white hairy border. Sometimes anterior and posterior crossbands connected by longitudinal stripe, and by white hairy border at elytral sides. Legs moderately long. Hind femora extend beyond elytral apex (male) or barely reach it (female). Body ventrally with dense white and compactly adherent as well as sparse (especially on abdomen) light-colored semiadherent hairs. Body, antennae, and legs black. Sometimes antennae and tibiae with brownish tinge. Body length 9.0 to 14.0 mm.

Egg: More elongate, broadly rounded at anterior pole, narrows toward posterior pole and pointed here. Chorion matte, with fine sculpture. Length 1.7 mm, width 0.6 mm.

Larva (Figure 97): Characterized by poorly developed, barely perceptible thoracic legs, and leathery, rugose locomotory abdominal ampullae. Head narrows slightly toward front. Epistoma with lustrous brownish border on anterior margin, barely notched near clypeus, laterally truncate, its anterior angles not produced forward. Median longitudinal and frontal sutures not visible. Hypostoma flat, with transverse wrinkles, notably narrows toward base, and with widely bifurcate sclerites; anterior half of each sclerite with two to three bristles forming transverse row; anterior margin with narrow rusty border. Gular plate flat, barely narrows toward front, with narrow rusty border on anterior margin. Parietals with brownish border on anterior margin, behind which long hairs, followed by short hairs occur. Antennae slender, comparatively long, and notably extend behind anterior margin of cephalic capsule. Ocelli near antennal base hyaline, convex, small, and distance between them and antennal base not more than diameter of ocellus itself. Clypeus short, trapezoid, with brownish tinge. Labrum whitish, narrowly



169 Figure 97. Larva of *Chlorophorus japonicus* (Chevr.).
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—tip of abdomen (dorsal view).

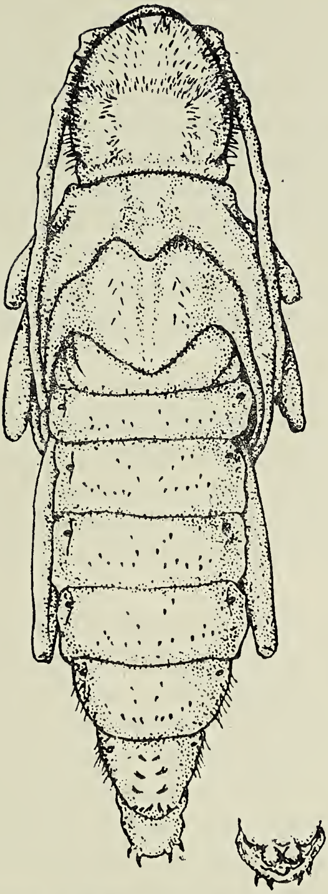
rounded apically, with short marginal bristles, disk glabrous and lustrous. Mandibles with short longitudinal basal groove, broadly rounded at apex and black, rusty-red at base. Labial mentum transverse, convex, with long rusty bristles on sides forming small cluster. Inner masticatory lobes of maxillae produced, brownish, whitish only at apex and here with thin light-colored bristles. Maxillary palps barely longer than inner lobes.

Pronotum in anterior half with two narrow transversely elongate yellow spots with small whitish notch each in anterior margin, laterally with one yellowish glabrous, longitudinally elongate spot. Hairs on disk before scutellum and on sides uniform, with rusty tinge, on posterior margin of yellow spots very sparse or totally absent. Pronotal shield white, lustrous, with fine dense longitudinal streaks, bound laterally by short curved longitudinal folds, with narrow median longitudinal groove and here on anterior margin insignificantly produced forward. Prester-
169 num laterally and on disk with dense, comparatively long, rusty hairs. Eusternum glabrous, posterior half divided by hairy field, leathery, and with shallow wrinkles. Thoracic legs small, with long sclerotized claw.

Abdomen moderately elongate, with dense rusty hairs on sides of locomotory ampullae, and mediolaterally with sparse short light-colored hairs. Dorsal locomotory ampullae leathery, with shagreen sculpture, rugulose, toward front divided by transverse groove from which short median longitudinal groove originates and one lateral groove on each side (diverging slightly toward each side); disk with alveolar depression that looks like an oblique groove on tergites VI to VII. Ventral locomotory ampullae slightly convex, leathery, rugulose, and sometimes with longitudinal streaks; divided by transverse groove joining lateral longitudinal grooves that diverge on back side. Body length of mature larvae 16 to 19 mm, width of head 2.0 to 8.0 mm.

Pupa (Figure 98): In chaetotaxy of pronotum resembles pupa of *C. diadema* (Motsch.). Differs in presence of numerous bristles on head
170 forming groups. Head slightly extended in frontal region, slightly depressed on vertex, smoothly rounded on occiput, with thin piliform bristles along sides behind antennal base and near anterior lobe of eyes, which form four distinct groups. Antennae short; apices in male extend beyond middle of abdominal tergite II, but only beyond posterior end of tergite I in female.

Pronotum slightly longer than wide, with almost parallel sides, narrow transverse groove near base, and produced posterior angles; disk mildly convex and with minute rusty piliform bristles forming common sparse field in anterior half and on sides; dense crossband in middle does not reach sides, from which one longitudinal aristate stripe originates



169 Figure 98. Pupa of *Chlorophorus japonicus* (Chevr.), female.

toward inner side of each posterior angle. Mesonotum convex, depressed immediately behind middle, with broadly rounded produced scutellum toward back side, and rusty bristles along sides forming one group on each side. Metanotum angularly produced toward back side, with median longitudinal groove, and sides with numerous rusty bristles.

Abdomen moderately elongate, narrows insignificantly anteriorly and gradually more posteriorly. Abdominal tergites fairly large, with dark brown sclerotized erect or slightly backwardly directed spinules forming long transverse series in posterior half (each row with eight to 12 spinules), middle transverse row immediately behind middle (with two large spinules shifted toward longitudinal groove), anterior half with jumbled row, sometimes in form of two groups (each with two to three spinules). Tergite VII elongate, narrowly rounded on back side and here with six to eight large acute spinules bent forward, forming posterior transverse row; two pairs of large spinules ahead of this row bend toward each other and form two transverse rows; two to four spinules ahead of latter rows, nearer base of abdomen, constitute anterior transverse row. Tergite VIII short, smoothly rounded posteriorly; posterior margin usually with four to six small sharp spinules bent toward middle and forward. Body length 11 to 15 mm, width of abdomen 3.5 mm.

Material: Collected on Kunashir Island. Adult insects 19, larvae 28, pupae—five males and two females, larval exuviae with beetles and pupae from pupal cells seven.

Distribution: Southern Sakhalin, Kunashir, Japan (Hokkaido, Honshu, Shikoku, Kyushu). There are reports of occurrence in Korea and northeast China.

Biology: Inhabits broad-leaved and mixed forests. Emergence of beetles observed from second half of June, in July, and in early August. Beetles visit flowers, after which they fly to trees inhabited by them. Female oviposits in bark crevices. Trunks and thin secondary branches (diameter 2.5 to 5.0 cm) of dry but viable and wind-felled trees preferred. Ovaries of one female that had started oviposition contained mature eggs.

Larvae initially live under bark, make longitudinal galleries, impressed in alburnum, then move deeper into wood and make longitudinal straight or meandering galleries, filling them with frass. Pupal cell made at end of gallery, in which larva cuts an exit on surface; layer of wood 2.0 mm thick remains between latter and bark. Length of gallery under bark 5.4 cm or more, width before moving into wood 3.0 to 4.0 mm; length of gallery in wood 1.7 cm, width 7.0 mm. Length of pupal cells up to 3.0 cm and width 8.0 mm. Pupation takes place in May and June. Young beetles emerge from pupal cells in June and July, but remain in cells for about one week. Subsequently they cut round openings (3.0 to 3.5 mm) on surface of branches and emerge through them. Beetles
171 require supplementary feeding. Ovaries of one female dissected immediately after emergence from wood were underdeveloped. Weight of larvae before pupation 69 to 71 mg (two specimens), young beetles before emergence from pupal cell 37.5 to 55.0 mg (three beetles). Generation completed in two years. Larvae of young and old age hibernate. Pupal cells usually made before secnod hibernation.

Cholorophorus japonicus (Chevr.) occurs on many trees on Kunashir Island. We raised 15 beetles from larvae collected from stems of wood in a forest, including 10 from birch, two from aralia, and one each from maple, alder, and *Lespedeza*. In addition, 35 larvae and pupae were collected during a forest survey: eight from birch, five oak, four briar, three each *Lespedeza* and maple, two each sour cherry, alder, aralia, common ash and oak, and one larvae each from mulberry and elm.

6a. **Chlorophorus motschulskyi motschulskyi** (Ganglb.)

Ganglbauer, 1886, *Horae. Soc. Entom. Ross.*, vol. 20, p. 135 (*Clytanthus*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 474–476; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, pp. 279–280.

Adult (Figure 99): Similar to *C. japonicus* (Chevr.). Differs in more elongate body, less produced outer angle of elytral apex, and other characters. Head with fine punctation, gray adherent hairs. Frons broad, flat, distinctly broadens toward front, and with longitudinal groove between antennae. Vertex depressed, with large deep punctures. Eyes broadly notched. Antennae reach middle of elytra (female) or even slightly beyond it (male). Fifth antennal segment longer than 4th, slightly shorter than or equal to 3rd.

Pronotum not longer or even less (female), rarely slightly longer (male) than wide, laterally rounded, with narrow bent posterior and anterior margins, disk markedly convex, with very dense punctation, short dense adherent grayish or yellowish hairs, long erect setaceous light-colored hairs (on sides as well as on disk), and in middle and on sides (isolated) with small black spots. Scutellum broadly rounded on back side, with gray adherent hairs.

Elytra with parallel sides, convex, with fine very dense punctation, distinctly longitudinally depressed on inner side of humeri, notable longitudinal depression on suture behind scutellum, and with fine adherent hairs; sides with transverse white hairy spot behind humeri that curves backward; longitudinally elongate spot in humeral notch; white border at base near scutellum; narrow transverse arcuate band before middle with inner end extending forward up to scutellum, and outer end almost up to marginal spot; crossband in posterior half behind middle that broadens rhomboidally on disk, narrows on sides; and broad white or grayish hairy border at apex. Hind femora barely reach (male) or do not reach (female) elytral apex. Hind tarsi long, slender; lst segment significantly longer than all other segments together. Body ventrally with tender grayish adherent hairy cover and semierect light-colored setaceous hairs. Episterna of meso- and metathorax and posterior margin of abdominal sternites with denser white hairy coat. Body, antennae, and legs black; apex of antennae sometimes light colored, rusty; sometimes antennae, tibiae, and tarsi light brown with rusty tinge. Body length 8.0 to 12.0 mm.

Egg: More elongate, gradually narrows toward posterior pole and
172 pointed here, broadly rounded at anterior pole. Chorion smooth, lustrous, translucent, with fine sculpture on poles, visible under high magnification. Length 1.6 mm, width 0.5 mm.

Larva (Figure 100): Similar to larva of *C. japonicus* (Chevr.). Differs in significantly produced anterior angles of epistoma. Head narrowly

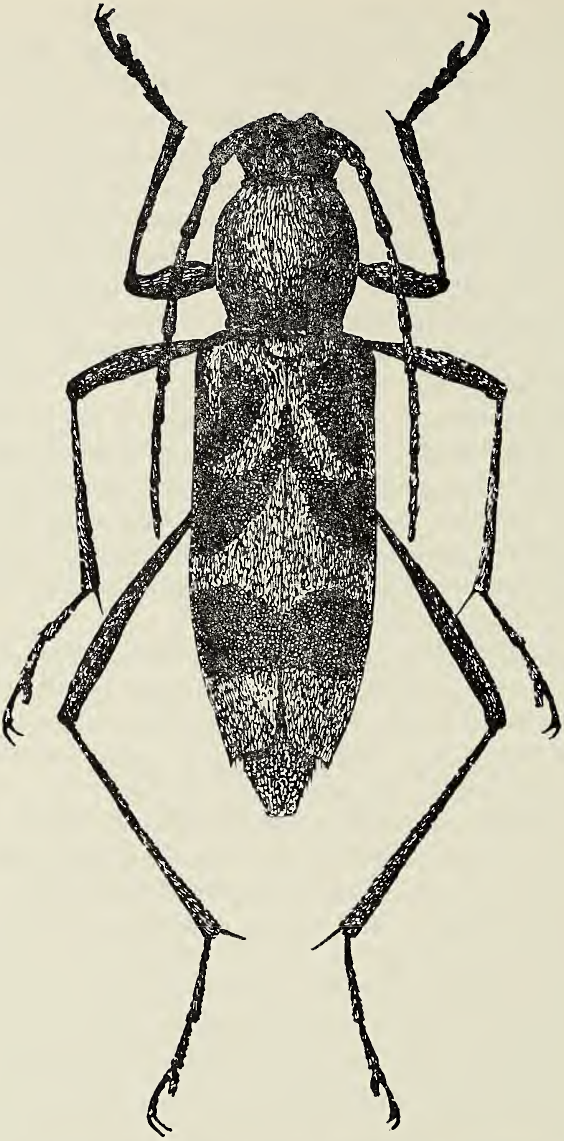


Figure 99. *Chlorophorus m. motschulskyi* (Ganglb.).

rounded toward front, markedly invaginated in prothorax. Epistoma smooth or with distinct transverse wrinkles, anterior margin with smooth lustrous brownish border, smooth notch near clypeus, and barely protruding, in any case not truncate, anterior angles; convex in anterior half, notably depressed at apex, with demarcated sides. Frontal sutures not visible. Median suture of epistoma lacking. Hypostoma narrows slightly toward front, with rounded anterolateral angles, with transverse wrinkles that sometimes extend onto anterior margin of temporo-parietals, anterior margin with rusty-brown border, and anterior half with long bristles forming transverse row. Gular plate broad, narrows insignificantly toward front, with convex sides. Parietals with sparse long hairs medially, and brownish border on anterior margin. Antennae long, slender; 2nd segment reaches beyond anterior margin of cephalic capsule. Ocellus near antennal base hyaline, convex, separated from antennal base by distance not more than its own diameter. Clypeus short, trapezoid, with brownish tinge. Labrum slightly convex, broadly rounded at apex, whitish, with brownish tinge at base, its anterior half with long rusty bristles. Mandibles on outer side near base with deep transverse groove, and angularly produced forward medially. Labial mentum transverse, with parallel sides, convex, and with long rusty bristles on sides. Inner masticatory lobes of maxillae thick, broaden toward apex and truncate here, whitish, with short light-colored bristles.

Pronotum slopes markedly toward head, with two transversely elongate spots, with narrow notch on anterior margin of anterior third; 173 sides with one large yellowish diffuse spot, disk ahead of shield and on

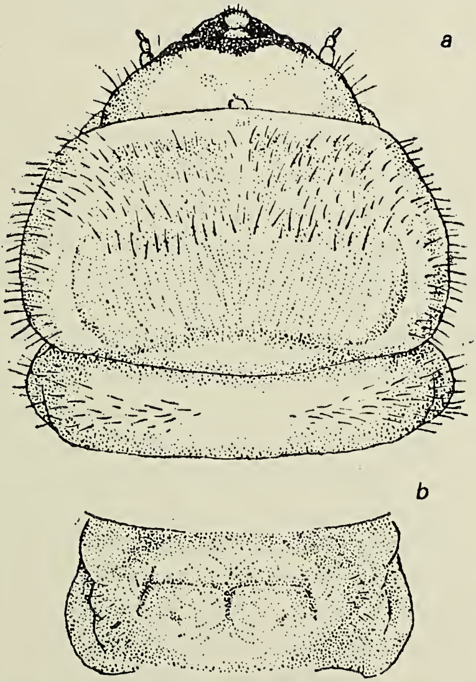


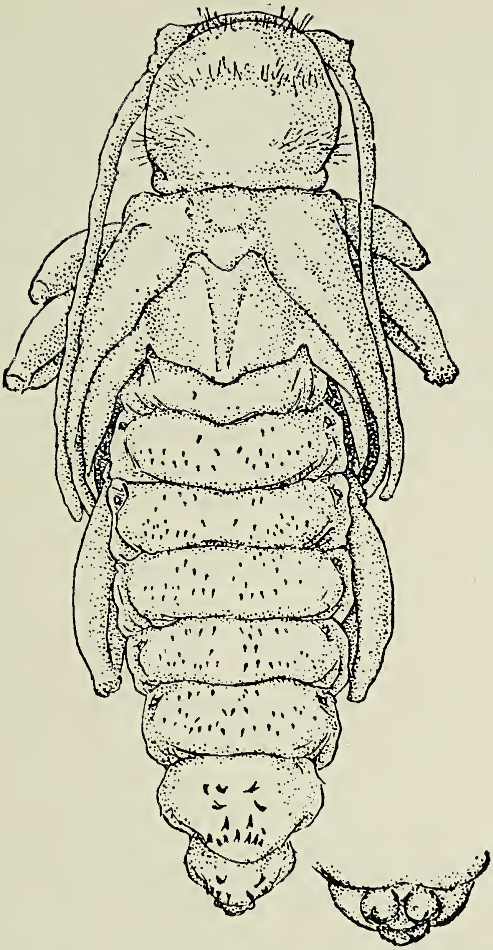
Figure 100. Larva of *Chlorophorus m. motschulskyi* (Ganglb.). a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

sides with uniform comparatively dense rusty hairs. Pronotal shield leathery, white, convex, laterally bound by deep longitudinal, slightly curved folds, with narrow median longitudinal groove posteriorly covered with fine silvery sculpture, longitudinal pattern toward front, anterior margin bidentate and angularly produced. Presternum uniformly covered with dense rusty hairs on sides and disk. Eusternum glabrous, leathery, sometimes distinctly rugulose, toward front with hairy field but often without it. Thoracic legs very small, like caruncles, with thin, sometimes sclerotized claw.

Abdomen laterally near locomotory ampullae and in middle (in pleural region) covered with dense long rusty hairs [in *C. japonicus* (Chevr.) abdominal pleura covered with very sparse short hairs]. Dorsal locomotory ampullae convex, leathery, rugose, toward front divided by transverse groove that joins lateral short, longitudinal and backwardly divergent grooves, with straight median longitudinal groove; disk with additional groovelike longitudinal folds that originate on four frontal tergites parallel to median groove, and extend obliquely onto posterior tergites from anterior angles of locomotory ampullae backward toward middle of disk. Ventral locomotory ampullae rugulose, divided in middle by transverse groove that joins long lateral and backwardly divergent
174 grooves. Body length of mature larvae 16 to 20 mm, width of head up to 2.8 to 3.0 mm.

Pupa (Figure 101): Differs from pupa of *C. japonicus* (Chevr.) in longer antennae and other characters. Head comparatively short, extends slightly ahead of antennae, and narrows slightly. Frons smoothly convex, lustrous, with longitudinal depression between antennae, two to four bristles along sides ahead of antennae, and anterior margin with short bristles forming longitudinal row. Clypeus and labrum with median longitudinal depression. Vertex flat, with four bristles along sides behind antennal base. Occiput broadly rounded and lustrous. Antennae flexed to sides, reach beyond middle of abdominal tergite II (female) or III (male). Antennae of *C. japonicus* (Chevr.) distinctly shorter.

Pronotum not longer (male) or even less (female) than width, broadly rounded in posterior half, narrows smoothly anteriorly and abruptly posteriorly, with narrow transverse basal groove, disk more convex in posterior half, slopes uniformly toward front, posterior slope glabrous and lustrous in middle, sides and disk in anterior half entirely covered with scattered piliform bristles that form denser crossband in middle. Mesonotum convex, with saddle-shaped depression behind middle, posterior margin with angularly produced shield, sides with stray or paired bristles. Metanotum convex, lustrous, with medial longitudinal channel-shaped groove, especially in anterior half, angularly rounded posteriorly, with stray bristles along sides forming row that extends from middle toward anterior angles.



173 Figure 101. Pupa of *Chlorophorus m. motschulskyi* (Ganglb.), female.

Abdomen moderately elongate, broadens in middle. Abdominal tergites uniformly convex, with sharp spinules directed backward forming three rows (hind row more uniform, consists of 10 to 14 spinules; middle row short, consists of four to six spinules, of which two adjacent to longitudinal groove notably larger than others; front row often jumbled, consists of two to 11 spinules, sometimes in clusters). Tergite I without spinules, with stray bristles or minute spinules forming one transverse row. Tergite VII convex, narrows posteriorly, narrowly rounded posteriorly, with four transverse rows of bristles (of which hind row at posterior margin of tergite consists of six to seven large spinules bent forward; each of two middle rows consists of two large spinules bent toward each other; front row consists of two to five large or minute spinules bent toward middle and backward). Tergite VIII laterally with longitudinal wrinkles, its length almost not less than width at anterior end, posterior margin with four to six bristles bent forward, and disk with stray spinules or without them. Valvifers of female large, hemispherical, slightly separated, and with barely noticeable apical tubercle. Body length 10 to 14 mm, width of abdomen 3.0 to 3.5 mm.

Material: Collected in forests of Ussuri-Primor'e region. Adult insects 88, larvae 56, pupae—two males and three females, larval exuviae from pupal cells with beetles six.

Distribution: Amur basin, Ussuri-Primor'e region; northeast China, Korean Peninsula.

Biology: Inhabits broad-leaved forests of the Far East. Ecologically associated with oak. Emergence of beetles begins mid-June and continues almost up to mid-August. Mass emergence observed in July. Beetles often appear on flowers, collecting pollen. Gonads mature during this period. Beetles most active in warm clear wheather from 11:00 a.m. to 6:00 p.m. Mature beetles fly from flowers to trees inhabited by them, where they mate. Female oviposits in bark crevices. Drying and dried 175 trees of oak are selected. Progeny often left on dying twigs of viable trees. Female can lay up to 48 eggs in her lifetime. Probably, the need for supplementary feeding arises during period of reproduction.

Larvae hatch from eggs after 2.0 to 2.5 weeks. According to observations recorded in forests in 1971 (Komarovka River), hatching of larvae took place 13 to 19 days, average 15.9 days, after oviposition. Average daily temperature during this period 20.1±0.8°C.

Mature larvae bore into bark, make galleries longitudinal to branch under bark and in upper layer of alburnum, and fill them compactly with frass. Width of gallery laid by young larva 1.5 mm, by mature larva up to 7.0 mm. Older larvae move deeper into wood, extend longitudinal gallery in upper layer of wood or in pith of thin branches, and fill it compactly with fine, often doughlike frass. Before or after second hibernation, larva makes pupal cell at end of gallery longitudinal to branch, cuts an exit up to bark in anterior end of cell, fills it with fine fibrous frass, and pupates with head toward exit. Length of pupal cells 1.8 to 4.0 cm, width 5.0 to 8.0 mm. Length of outlet of pupal cell up to 6.0 mm; outlet filled with brown meal.

Pupation of larvae begins end of May and ends in June. Pupae develop for about three weeks. We kept six larvae under observation in the laboratory. Beetles developed 16 to 23 days, average 18.5 days, after pupation. Laboratory temperature during this period was maintained at 16.8 to 19.8°C. Beetles acquire normal color five days after discarding pupal exuvia. Subsequently they cut through frass in gallery exit, make circular opening on surface (3.5 to 5.0 mm in diameter) and exit from pupal cell. Young beetles emerge from pupae in middle or end of June and in early July. Emergence of beetles from wood completed mid-July. Generation completed in two years. In autumn, in addition to mature larvae, young larvae also found which enter hibernation for first time. Reduction in weight during metamorphosis is illustratcd by the following examples. Weight of 15 individuals: larvae before pupation 35 to 94 mg, pupae 32.0 to 85.8 mg, young beetles before emergence from wood 26 to 27 mg. In another group, 13 larvae before pupation varied in weight from 54 to 130 mg, pupae 44 to 117 mg, and young beetles soon after discarding pupal exuvia 38 to 105 mg.

Chlorophorus m. motschulskyi (Ganglb.) damages trees, often inhabiting branches 1 to 5 cm in diameter. We raised 75 beetles from larvae collected from oak in a forest. We did not find this subspecies on other trees.

6b. **Chlorophorus motschulskyi chasanensis** Tsherepanov, ssp. n.

Adult (Figure 102): Differs well from nominal form in entirely rounded elytral apices. Head with dense tender gray hairs, fine punctation, and occiput with more distinct punctation. Frons flat, with median longitudinal groove. Antennae with dense gray adherent hairs, apices almost reach middle of elytra. Eyes markedly convex, with sharp fine facets, and deeply notched on inner side. Pronotum slightly oblong, smoothly rounded laterally, anterior and posterior margins with narrow border, disk uniformly convex, with dense deep punctation, dense gray adherent and thin brownish erect hairs, medially with large spot, later-
176 ally small round black lustrous spot. Scutellum flat, narrowly rounded posteriorly, with dense gray hairs.

Elytra with parallel sides or narrow slightly posteriorly, entirely rounded at apex, with deep longitudinal notch at base on inner side of humeri, with narrow gray hairy band in anterior half that extends toward scutellum, broad transversely rhomboid band medially and behind middle, longitudinal gray spot near base, and broad gray hairy border at apex. Legs long, slender; hind femora reach beyond elytral apex. Body, elytra, legs, and antennae black. Sometimes tarsi and antennae with brownish or rusty tinge. Body length 9.0 to 12.0 mm. Elytra sometimes with truncate inner and sharply produced outer angles at apex, or smoothly rounded with barely spinelike produced angles.

Egg: White, elongate, narrows slightly more toward one pole, generally rounded at poles. Chorion transparent, smooth. Length 1.2 mm, width 0.4 mm.

Larva (Figure 103): Differs from nominal form partly in denser hairy cover on pronotum and broader gular plate, similar to it in other

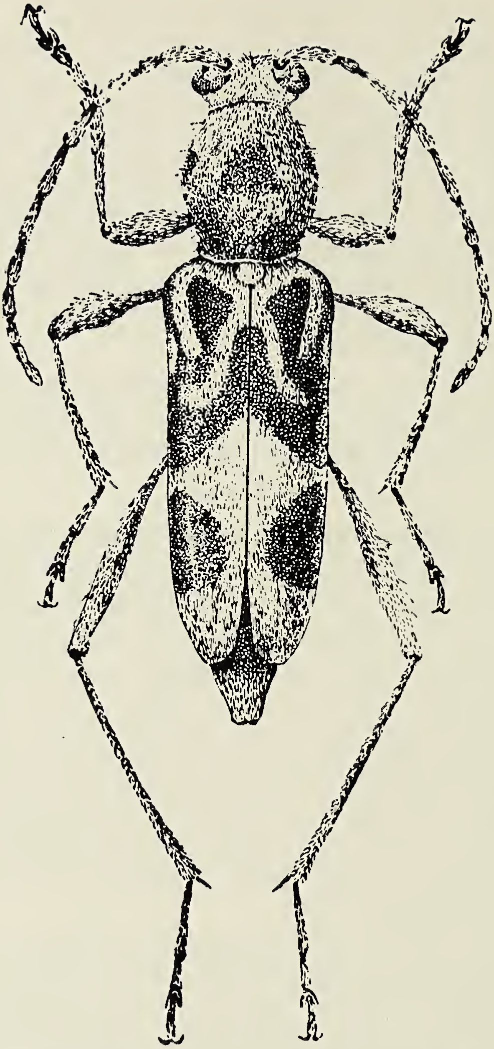


Figure 102. *Chlorophorus m. chasanensis* Tsher.

respects. Head markedly retracted into prothorax, narrowly rounded in front. Epistoma convex, with lustrous brownish border on anterior margin, stray setaceous hairs behind it arranged in pairs on sides and in middle, barely perceptible longitudinal suture, frontal sutures smoothened, not visible. Hypostoma slightly convex, transversely rugulose, with short bristles forming transverse row. Gular plate colorless, broad, its width not less than length. Parietals with long thin light-colored hairs in anterior half, and narrow brownish border on anterior margin that does not cover antennal sockets from behind. Antennae long, slender, with brownish tinge at apex; apices conspicuously extend beyond anterior margin of cephalic capusle.

Pronotum narrows insignificantly and rounded toward front, with very dense rusty hairs ahead of shield and on sides, with pair of transversely elongate yellow spots near anterior margin, one longitudinally elongate diffuse spot on sides. Pronotal shield white, leathery, bidentate
177 at anterior margin, and markedly produced forward medially. Presternum uniformly convex, covered uniformly with dense rusty hairs. Eusternum glabrous, not demarcated laterally, merges into general surface of prosternum, and divided by hairy clearance at anterior margin.

Abdomen narrows gradually posteriorly, with dense rusty hairs along sides of locomotory ampullae. Locomotory ampullae leathery, well developed on abdominal segments I to VII. Dorsal locomotory ampullae convex, toward front with transverse, sometimes indistinct groove, which medially and laterally joins deep longitudinal groove, and sometimes with alveolar notch on disk. Body length up to 16 to 18 mm, width of head 3.5 mm.

Pupa (Figure 104): Quite similar to pupa of *Chlorophorus m. motschulskyi* (Ganglb.). Differs only in arrangement of lateral bristles in posterior half of pronotum. Head narrows toward front, slightly transversely convex between antennae, with bristles behind antennal base forming transverse row or clusters, and long bristles on anterior margin ahead

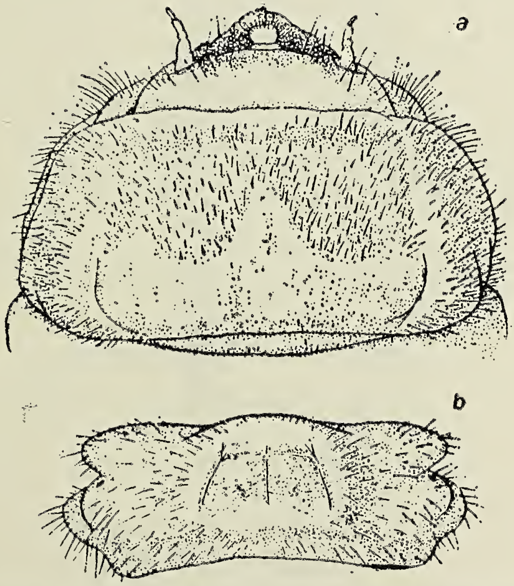
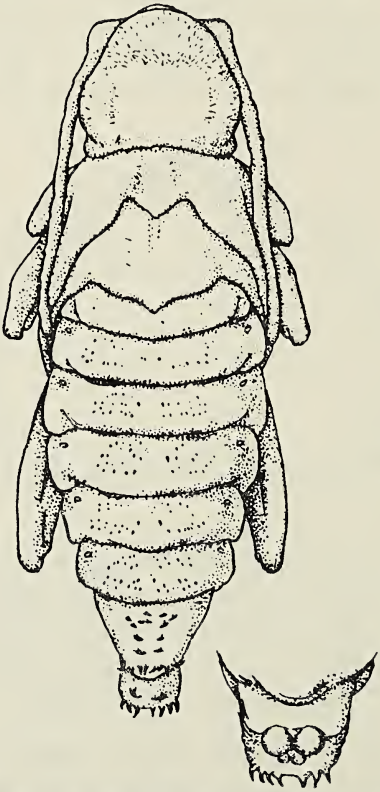


Figure 103. Larva of *Chlorophorus m. chasanensis* Tsher. a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

of clypeus forming transverse row. Antennae flexed to sides, with apices reaching beyond middle of abdominal tergite II (female).

Pronotum convex, smoothly rounded laterally, with narrow transverse groove near posterior margin, anterior half covered with scattered bristles, middle part with dense bristles (forming hairy crossband), posterior slope glabrous, with sparse bristles along sides of posterior half forming longitudinal stripe. Mesonotum with angularly produced shield on posterior margin, which is depressed, saddle shaped in middle, and with short bristles along each side forming paramedial group. Metanotum with narrow median longitudinal groove, with bristles along each side forming sparse longitudinally extended stripe. Abdominal tergites
178 convex, with common median longitudinal groove and minute spinules along its sides, forming one roundish or triangular group on each tergite. Tergite VII triangular, broadly rounded at apex, with large ungual bristles, of which eight form common transverse row on posterior margin, six on disk form three transverse rows (two spinules in each row), and eight near base form crossband. Tergite VIII broadly rounded posteriorly, with eight spinules on posterior margin bent forward, and two



177 Figure 104. Pupa of *Chlorophorus m. chasanensis* Tsher., female.

spinules on disk bent toward middle (on inner side). Valvifers of female adjacent, large, and hemispherical. Body length up to 12 mm, width of abdomen 4.0 mm.

Material: Collected in region of Lake Khasan (Ussuri-Primor'e region). Adult insects 28 (holotype male, Khasan, raised from larva collected from oak on November 29, 1978), larvae 14, pupae—two females.

Distribution: Found only in environs of Lake Khasan; not found northward and hence this form was separated as a subspecies.

Biology: Inhabits broad-leaved forests. Ecologically associated with oak. Emergence of beetles completed in first half of summer. Female oviposits in bark crevices of thin branches 1.0 to 2.5 cm in diameter. Embryonic development continues for about three weeks. Under laboratory conditions larvae developed on February 7th to 8th from eggs laid January 17 to 22. Ambient temperature during this period varied from 15.6 to 24.0°C (average 19.3 ± 0.6°C).

Larvae live in wood, make longitudinal galleries along pith, and fill them compactly with fine frass. After second hibernation larva makes pupal cell at end of gallery, cuts oval opening (4.0 mm × 2.0 mm) on surface of bark longitudinal to branch, fills it compactly with frass, and pupates with head facing opening. Under laboratory conditions at 16.8 to 19.8°C (average 18.4 ± 0.2°C) pupal stage (based on observations of six individuals) continued for 16 to 23 days, average 18.5 ± 1.0 days. Mature beetles cut frass from opening, widen it, and exit from pupal cell. Width of gallery made by mature larvae up to 5.0 mm. Length of pupal cell 2.3 to 4.0 cm, width 5.0 to 6.0 mm; length of frass plug closing outlet 5.0 to 6.0 mm. Galleries generally made from top downward, and pupa positioned in pupal cell with head downward. Weight of larvae before pupation (13 individuals) ranged from 54 to 130 mg (93.1 ± 5.8), pupae 44 to 117 mg (80.7 ± 5.8), and beetles before emergence from wood 38 to 105 mg (67.0 ± 5.0). Overall reduction in weight during metamorphosis, 29.1%.

This subspecies damages thin branches of oak and was not found on other trees.

7. **Chlorophorus figuratus** (Scop.)

Scopoli, 1763, *Entom. Carn.*, p. 55 (*Cerambyx*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 472–474.

Adult (Figure 105): Similar to *C. gracilipes* (Fald.). Differs in presence of erect hairy cover on pronotal disk and short antennae. Body moderately elongate. Frons flat, distinctly broadens toward front, with fine dense punctation, dense adherent gray hairs, with narrow median longitudinal groove almost throughout length, elongate tubercle near antennal base, and slopes abruptly backward. Vertex depressed, with large 179 punctures, sparse gray hairs, and median longitudinal groove originating from frons. Antennae comparatively short, extend beyond anterior band (female) or posterior band (male) of elytra; 5th antennal segment longer or almost equal to 4th, shorter than 3rd.

Pronotum highly rounded laterally, length almost equal to (male) or even less (female) than width, disk hemispherically convex, with very dense punctation, minute gray and brownish sparse adherent hairs; sides and disk with numerous erect light brown hairs [in *C. gracilipes* (Fald.) erect hairs absent on pronotal disk]. Scutellum slightly convex, narrowly rounded anteriorly, and with dense gray adherent hairs.

Elytra with parallel sides, convex, with distinct smooth notch near humeri at base, short longitudinal depression on suture behind scutellum, truncate at apex, with sharp spinelike outer angle, rounded or slightly produced inner angle; with fine dense but distinct punctation, minute adherent brownish hairs, short and relatively broad white dense hairy spot not reaching elytral base, marginal transverse spot behind

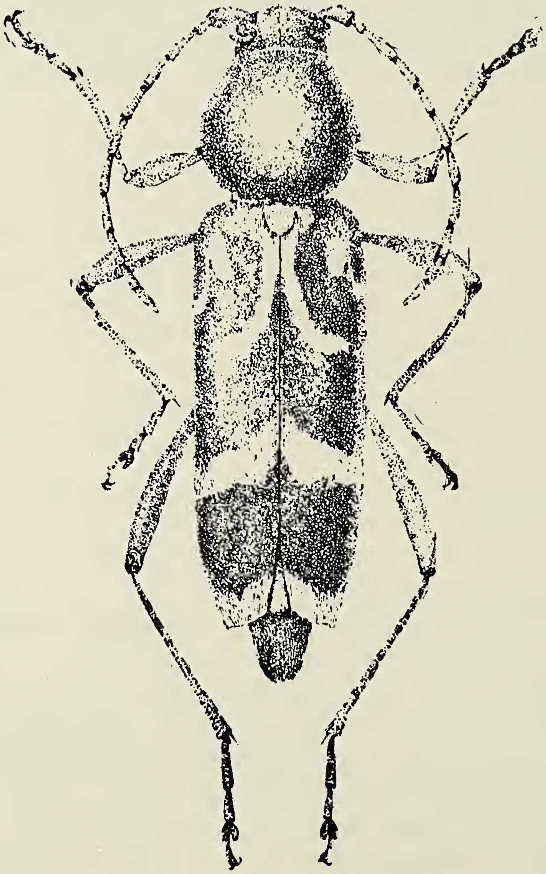


Figure 105. *Chlorophorus figuratus* (Scop.).

humeral tubercle; short white crossband originating from sides curves forward up to scutellum in anterior half; crossband behind middle narrower on sides and broadens at suture; and white hairy border at apex (f. *typica*). Sometimes marginal and humeral spots fuse (ab. *humerolateralis* Plav.), anterior marginal spot either absent (ab. *lateroreductus* Plav.), or posterior band broadens markedly not only at suture, but also on sides (ab. *latifasciatus* Fisch.). Body, antennae, and legs black. Tarsi sometimes with rusty tinge. Body length 7.0 to 13.0 mm.

Distribution: From the Mediterranean Sea to Sweden, Atlantic Ocean to southern Urals, western Siberia up to Lake Baikal. However, occurs rarely in the USSR; we did not find it. Described from collections of the Zoological Museum, Moscow State University.

Biology: Inhabits deciduous forests. Mature beetles emerge from June to August and visit flowers. This species inhabits birch, willow, poplar, aspen, and other deciduous trees (Plavil'shchikov, 1940).

180 8. **Chlorophorus diadema** (Motsch.)

Motschulsky, 1853, *Études Entom.*, vol. 2, p. 48 (*Clytus*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 477–479; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 82.

Adult (Figure 106): Characterized by broad pronotum, broad, convex, not very elongate elytra, and comparatively short 1st segment of hind tarsi. Frons broad, slightly notched near eyes, broadens toward front, insignificantly longitudinally convex in middle part and sometimes with narrow smooth carina here which converts into vertex, with longitudinal depression toward front along sides of antennal base, and covered with minute gray adherent hairs. Vertex slightly depressed and covered with gray hairs. Occiput glabrous with dense rugose punctation. Antennae short, do not reach middle of elytra, and thicken slightly toward apex. Fifth antennal segment equal to 4th or slightly longer, shorter than 3rd.

Pronotum broad, length not more (male) or even slightly less (female) than width, laterally rounded, with hemispherically convex disk, slopes abruptly posteriorly and smoothly anteriorly, with or without short longitudinal groove on posterior slope, narrow constriction posteriorly, sharply turned margin, and dense punctation; disk with black or dark brownish hairs, posterior slope and sides with white adherent hairs, and black aristate dots on sides in posterior half. Scutellum slightly convex, sometimes slightly depressed longitudinally, and covered with minute gray adherent hairs.

Elytra convex, slightly elongate, with parallel sides, broad longitudinal depression near base around humeri, obliquely truncate at apex, with produced sharp outer angle and rounded or spinelike inner, and covered with very fine dense punctation; dense fine adherent dark brownish and white hairs form usual pattern or longitudinal broad or narrow

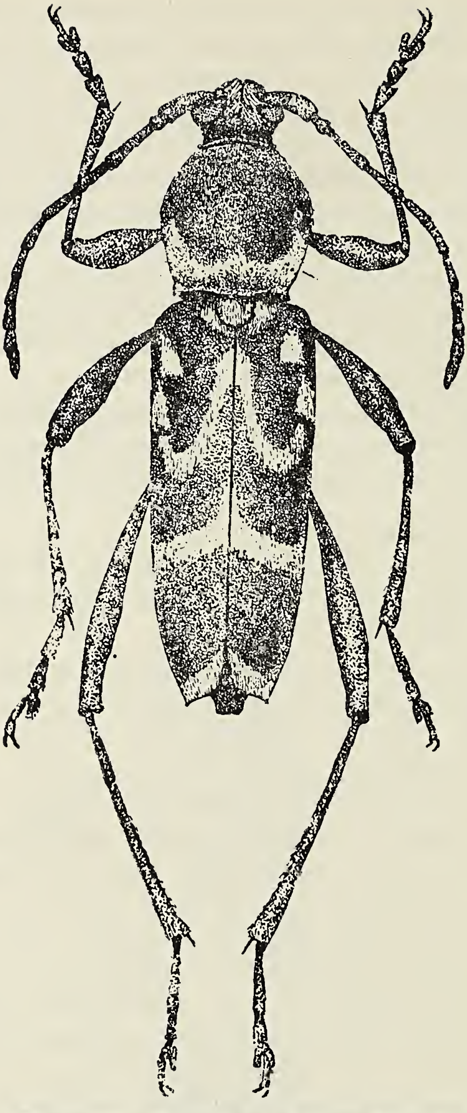


Figure 106. *Chlorophorus diadema* (Motsch.).

white spot, and sometimes broad spot on sides behind humeri; anterior crossband extends along suture toward scutellum; posterior crossband broadens near suture behind middle; and white border on apex. Elytral
181 pattern fairly stable, variations (Plavil'shchikov, 1940) minor. Body entirely covered ventrally with dense compactly adherent and stray light-colored semiadherent hairs. Hind femora reach beyond elytral apex (male) or barely short of it (female). Hind tarsi comparatively short; 1st segment not longer than remaining segments together. Body, antennae,

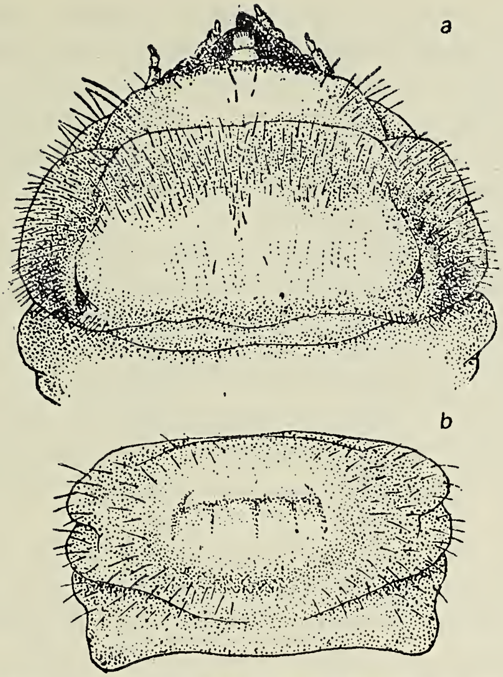


Figure 107. Larva of *Chlorophorus diadema* (Motsch.).
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

and legs black, sometimes with brownish tinge. Body length 8.0 to 14.0 mm.

Egg: White, elongate, with broadly rounded anterior pole and narrowly rounded posterior pole. Chorion smooth, lustrous, transparent. Length 1.5 mm, width 0.5 mm.

Larva (Figure 107): Characterized by absence of thoracic legs, rugose dorsal locomotory ampullae, and presence of additional longitudinal grooves on ampullae. Head narrowly rounded anteriorly. Epistoma convex, with brownish-rust border on anterior margin, insignificantly notched near clypeus and along sides, slightly produced forward at anterior angles, and laterally fused with parietals. Frontal sutures not visible. Median suture absent. Hypostoma narrows insignificantly toward front, slightly convex, without rusty border on anterior margin, with rusty bristles in anterior half forming mixed row or group. Gular plate flat, barely narrows toward front, oblong, and without border on anterior margin. Parietals with sparse hairs medially, barely perceptible brownish border on anterior margin that does not cover ocular-antennal area from behind. Antennae comparatively long; 2nd antennal segment extends beyond anterior margin of cephalic capsule. Ocellus near antennal
182 base small, hyaline, convex. Clypeus trapezoid, smooth, with brownish

tinge. Labrum whitish, convex, rounded anteriorly, with long light-colored bristles. Mandibles convex, black on outer side, broadly rounded at apex, with transverse groove near base, and angularly produced forward here. Labial mentum transverse, convex, with parallel sides, and cluster of long rusty bristles on each side. Inner masticatory lobes of maxillae very thick, their length slightly more than thickness, with rusty bristles forming crown at apices.

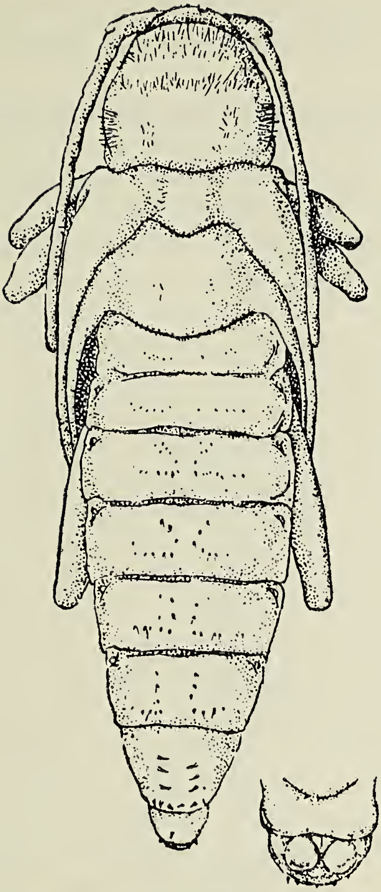
Pronotum slopes markedly toward head; yellowish spots in anterior third not perceptible, or just barely so, diffuse; disk with thin rusty hairs before shield and on sides. Pronotal shield convex, white, leathery, smooth, bound laterally by short deep outcurved longitudinal folds, with narrow median longitudinal groove, anterolaterally with insignificant notch, and slightly angularly produced forward medially. Sides and disk of presternum with long light rust hairs. Eusternum glabrous, leathery at base, divided medially by broad hairy clearance toward front. Thoracic legs absent.

Abdomen laterally with sparse light-colored or light rust hairs. Dorsal locomotory ampullae very convex, leathery, coarsely rugose, divided by transverse groove toward front from which short longitudinal grooves originate backward—two on each side, one in middle, and one additionally on disk. Ventral locomotory ampullae convex, transversely elongate, divided by median transverse groove that joins lateral longitudinal, sometimes indistinct, folds. Body length of last-instar larvae 17 to 20 mm, head width 3.0 mm.

Pupa (Figure 108): Characterized by short antennae, only reaching beyond abdominal segment I, arrangement of bristles on pronotum, and other characters. Head flat on vertex, laterally behind antennal base with stray bristles; frons slightly convex here with long single or paired bristles laterally and on anterior margin. Clypeus and labrum longitudinally depressed, with long paired lateral bristles. Antennae short, comparatively thick, barely reach beyond posterior margin of abdominal tergite I.

Pronotum slightly transverse, slightly rounded laterally, with narrow transverse groove posteriorly; disk broadly convex, with rusty piliform bristles forming narrow dense median transverse stripe that does not extend far on sides, from which one lateral sparse aristate stripe originates toward inner margin of posterior angles; anterior margin and sides with dense or sparse bristles. Mesonotum transversely depressed behind middle, with barely produced scutellum on posterior margin, and laterally with rusty, sometimes numerous bristles forming cluster. Metanotum convex, with shallow and indistinct median longitudinal groove, and laterally with bristles forming distinct cluster.

Abdomen narrows anteriorly and posteriorly. Abdominal tergites uniformly convex, with narrow median longitudinal groove, with three to



181 Figure 108. Pupa of *Chlorophorus diadema* (Motsch.), female.

four spinules forming transverse row on each side of groove in posterior half; two spinules near groove, ahead of this row, constitute, together with stray minute lateral spinules, median transverse row; anterior half
183 with single or paired minute spinules forming anterior transverse row. Two anterior tergites with minute aristate spinules forming single transverse row. Abdominal tergite VII elongate, rounded posteriorly and here with four to five spinules forming transverse row; usually with three pairs of large and incurved spinules toward front forming three transverse rows on disk, one behind the other. Tergite VIII smoothly rounded posteriorly, with six to eight small spinules on posterior margin. Abdominal sternites laterally with minute bristles forming transverse row. Valvifers of female hemispherical, with indistinct round apical tubercle. Body length 10 to 15 mm, width of abdomen 3.0 to 3.5 mm.

Material: Collected in Ussuri-Primor'e region. Adult insects 21, larvae 22, pupae—one male and five females, larval exuviae with beetles from pupal cells five.

Distribution: Ussuri-Primor'e region; northeast China, Korean Peninsula, Japan.

Biology: Belongs to group of species forming part of biocenose of broad-leaved forests. Emergence of beetles recorded from second half of June to mid-August. Beetles more abundant in second half of July. They visit flowers of various plants, then fly to trees inhabited by them. Female lays eggs singly in bark crevices. Ovaries of one female that had just begun to oviposit contained 38 eggs. At 26°C larvae hatch from eggs 12 to 13 days after oviposition. Larvae begin to hatch in nature in July and finish by end of August. Newly hatched larvae move under bark, make longitudinal galleries, then move deeper into wood and make longitudinal galleries directed upward, filling them with compact frass. Pupal cell made at end of gallery (usually after second hibernation) longitudinal to trunk, from which gallery continues upward; exit cut from pupal cell on surface filled with frass. Length of gallery in wood 20 cm or more, width 7.0 mm. Length of pupal cell with gallery 4.0 to 7.0 cm, width up to 8.0 mm. Length of exit from pupal cell 0.5 mm. Thickness of layer of wood between exit and bark 3.0 to 5.0 mm.

Pupation of larvae begins in second half of May and terminates in June. Pupal stage, depending on temperature, continues for two to three weeks. Emergence of beetles from pupae begins middle of June and terminates early July. Generation completed in two years. This is confirmed by the fact that beetles and middle-aged larvae are found simultaneously in wood in July. Variations in weight in a given population (based on records of 10 individuals): larvae 43 to 126 mg, pupae 39.0 to 115.8 mg, and adults before emergence from wood 31.0 to 91.4 mg.

Chlorophorus diadema (Motsch.) develops on pseudoacacia (*Maakia amurensis)*, birch, and oak, inhabiting slender viable plants of oak up to 1.6 cm thick (usually in basal zone) as well as thicker trunks 6.0 cm or more in diameter. All beetles were raised from larvae collected in nature; 10 from pseudoacacia, and one from oak. In addition, larvae, pupae, and adults (32 individuals) were collected during an inspection on forests: 24 on pseudoacacia, seven on birch, and one on oak. *Asias halodendri* (Pall.) was found together with this species in oak undergrowth.

9. **Chlorophorus gracilipes** (Fald.)

Faldermann, 1835, *Mem. Acad. St. Petersb.*, vol. 2, p. 436 (*Clytus*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 481–483; Cherepanov and Cherepanova, 1972. *Trudy Biol. In-ta*, vol. 11, pp. 55–62; Cherepanov and Cherepanova, 1974, *Usachi vinograda amurskogo*, pp. 47–51; Cherepanov and Cherepanova, 1975, *Zhuki-drovoseki ivovykh lesov Sibiri*, pp. 102–108.

184 *Adult* (Figure 109): Body elongate. Head with fine compact punctation, and gray, not very dense adherent hairs. Frons broad, with median longitudinal groove in posterior half that converts into vertex. Antennae

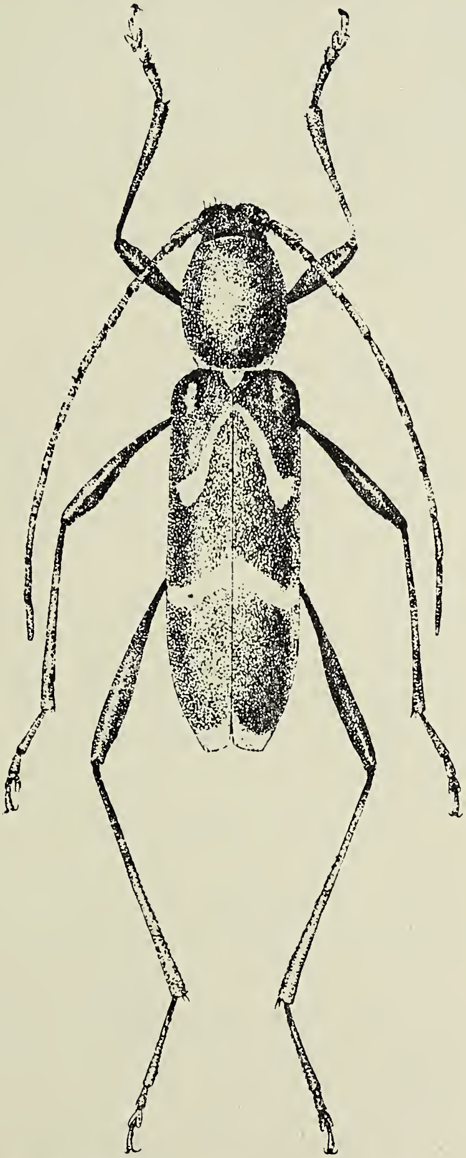


Figure 109. *Chlorophorus gracilipes* (Fald.).

long, slender, in male extend beyond elytral apex, in female reach posterior slope of elytra, with adherent gray hairs, and dense setaceous hairs on lower side of 2nd to 6th segments. Fifth antennal segment longer than 4th, and not shorter than 3rd.

Pronotum oblong, laterally uniformly and smoothly reduced, uniformly narrows anteriorly and posteriorly, with narrow curved border on anterior and posterior margins; disk uniformly convex, with very dense punctation, fine sparse brownish hairs, only sides with uniformly erect sparse setaceous hairs. Scutellum narrows from posterior to anterior end, narrowly rounded posteriorly, with dense white adherent hairs. Elytra elongate, with parallel sides, rounded humeri, barely perceptible longitudinal notch on inner side of humeri, obliquely truncate at apex, with sharply produced outer angle and less produced or rounded inner angle, with very fine dense punctation, and minute brownish and denser white adherent hairs forming pattern of white spots and transverse narrow bands. White longitudinally elongate spot on inner side of humeri; small spot on sides in anterior half; anterior transverse band extends obliquely forward and bands along suture ahead of middle; posterior crossband bends slightly ahead of suture behind middle; and broad white border at elytral apex. Body ventrally with adherent and sparse semiadherent hairs. Episterna of pro- and mesothorax, posterior margin of metasternum and first three abdominal sternites with dense adherent white hairs. Legs long and slender. Hind femora extend beyond elytral apex (male) or only reach it (female). Body, antennae, and legs black. Body length 6.0 to 11.0 mm.

Egg: White, elongate, narrows more toward one pole, broadly rounded at anterior pole and narrowly rounded at posterior pole. Chorion with fine sculpture, matte. Length 1.2 mm, width 0.4 mm.

Larva (Figure 110): Head narrows slightly toward front, significantly retracted into prothorax. Epistoma smooth, lustrous, its anterior margin
185 near clypeus with narrow notch and dark brownish lustrous border, laterally fused with parietals. Frontal sutures not visible. Median suture barely visible in posterior half of epistoma. Hypostoma narrows slightly toward front, slightly convex, with narrow rusty border on anterior margin, small notch near inner angles of sclerites, and with rusty bristles forming transverse row in anterior half. Gular plate narrow, narrows slightly toward front, and without rusty border on anterior margin. Parietals with rusty border on anterior margin, and with sparse hairs medially. Antennae short, slender, barely protrude beyond anterior margin of cephalic capsule. Ocelli convex, shifted close to antennal base, and sparsely pigmented. Space between antenna and ocellus less than diameter of latter. Clypeus short, barely protrudes from under epistoma, lustrous, and with brownish tinge. Labrum small, convex, transverse,

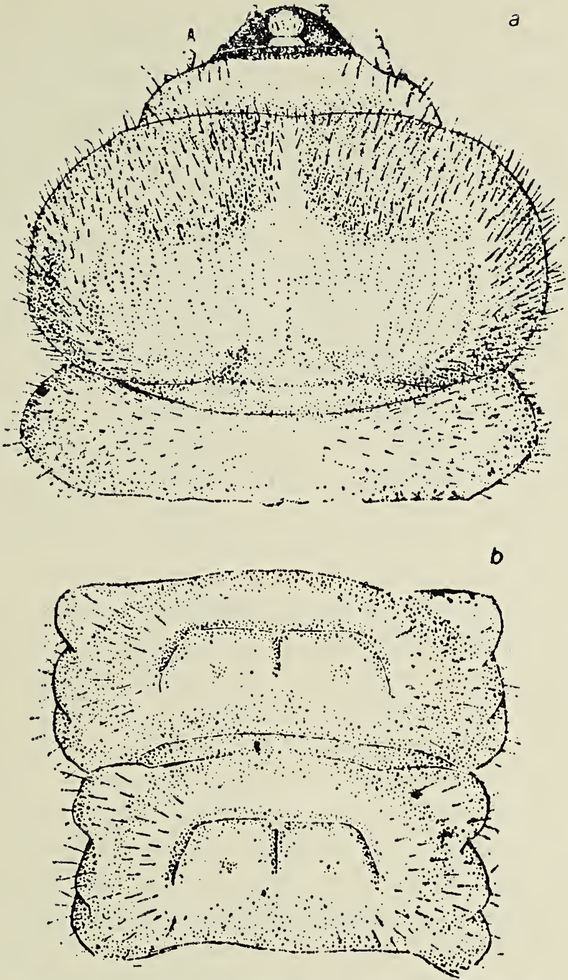


Figure 110. Larva of *Chlorophorus gracilipes* (Fald.). a—head and pronotum; b—abdominal tergites with dorsal locomotory ampullae.

broadly rounded at apex, and with long rusty bristles along margin. Mandibles compressed near base on outer side, and probably rounded at apex. Labial mentum transverse, broadly rounded medially, and with cluster of rusty bristles on each side.

186 Pronotum slopes markedly toward head, with two faint yellow transverse spots in anterior third, longitudinally elongate glabrous yellowish spot on sides, and on anterior half of disk (including yellow spot) and sides (excluding yellow spot) covered with uniform rusty hairs. Pronotal shield convex, white, leathery, bound laterally by short longitudinal curved or straight folds, more convex posteriorly, anterior half with

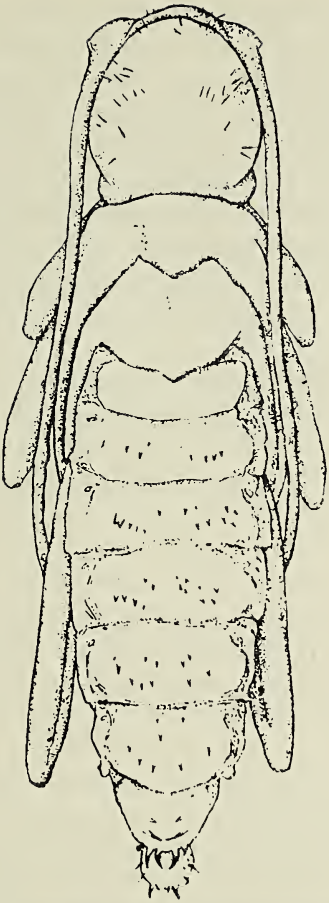
longitudinal streaks, narrow median longitudinal groove, and angularly produced forward on anterior margin. Presternum glabrous on anterior margin, with dense rusty hairs otherwise. Eusternum glabrous, leathery, with minute wrinkles visible under high magnification. Thoracic legs lacking, present only in mature larvae before pupation; in some larvae poorly developed, while in those from which females later develop they are well developed.

Abdomen elongate, sides with sparse light-colored hairs. Dorsal locomotory ampullae moderately convex, anterior margin divided by transverse groove from which three short grooves originate backward—one median and two lateral. Ventral locomotory ampullae divided by transverse groove that joins lateral short longitudinal grooves. Body length of mature larvae 13 to 15 mm, width of head about 1.7 mm.

Pupa (Figure 111): Body elongate, head bent down, narrows markedly ahead of antennae, slightly transversely convex between antennae, vertex flat, and longitudinally depressed on clypeus and labrum. Antennae long, slender, flexed to sides, and apically bent ventrad. First antennal segment apically on outer side with stray piliform bristles.

Pronotum oblong, with almost parallel sides, narrows slightly anteriorly and posteriorly, with narrow transverse groove near posterior margin, slightly convex on disk, with barely protruding transverse streaks or without them; with minute piliform bristles forming very narrow median transverse stripe, two groups on each side on posterior slope (one on sides before posterior angles, the other closer to median line), and sparse transverse stripe on anterior margin. Mesonotum transversely depressed behind middle, with barely produced scutellum on posterior margin, which appears glabrous, with stray and barely visible bristles only on sides. Metanotum slightly convex, broadly rounded posteriorly, with median longitudinal groove, and with stray piliform bristles on sides.

Abdomen elongate, narrows gradually posteriorly. Abdominal tergites insignificantly convex, with narrow median longitudinal groove, posterior margin with sharp spinules directed backward forming distinct or jumbled transverse row (two to five spinules on each side of longitudinal groove); spinules ahead of this row form median transverse row (one to two spinules on each side of longitudinal groove); anterior half with minute spinules forming anterior transverse row. Tergite I with very small spinules or glabrous. Tergite II with spinules forming transverse row only on posterior margin. Tergite VII triangular, narrowly rounded posteriorly, with four to five large spinules on posterior margin bent forward and forming transverse row; two spinules ahead of this row bent toward each other and form median transverse row; anterior half with minute spinules forming anterior, sometimes jumbled row.



185 Figure 111. Pupa of *Chlorophorus gracilipes* (Fald.).

Tergite VIII broadly rounded posteriorly, and here with one to four large or small spinules, or none whatsoever; disk sometimes with small lateral bristles. Valvifers of female large, hemispherical, with sharply 187 produced apical tubercle. Hind femora apically extend beyond abdominal tergite V (female) or VI (male). Body length 10 to 14 mm, width of abdomen 2.5 to 2.8 mm.

Material: Collected in the Urals, western and eastern Siberia, and Ussuri-Primor'e region. Adult insects 2,697, larvae 276, pupae—20 males and females, and larval and pupal exuviae with beetles from pupal cells 27.

Distribution: From the Urals to the Pacific coast within the limits of all northern Asia; northern Mongolia, northern China, Korean Peninsula; Japan. Collections from Sakhalin and Kunashir Islands also available. Found maximally in southern regions of Siberia. Also reported for central regions of the European part of the USSR.

Biology: Inhabits deciduous and mixed forest plantations. Ecologically associated with many trees, but predominantly deciduous. Rises in mountains up to 1,000 m above msl. Emergence of beetles begins mid-June and continues up to mid-August. Mass emergence observed end of June to end of July. Over several years we collected 808 beetles from Altai in the environs of Lake Telets during systematic surveys in the season: 20.4% in June, 77.1%—July, 2.4%—August, and 0.1%—September. During the summers of 1968 to 1969 we collected 684 insects from mixed linden forests in Salair: 21.7%—June, 73.0%—July, 4.8%—August, and 0.5%—September. Similar observations were recorded for the Far East and other regions.

Beetles numerous on flowers of Umbelliferae (*Heracleum, Aegopodium, Bupleurum*), Rosaceae (*Spiraea, Filipendula, Potentilla, Sorbaria*). Asteraceae (*Achillea, Matricaria*), and others. They are most active in warm weather from 11:00 a.m. to 6:00 p.m., and periodically fly from flowers to trees inhabited by them, where they mate and oviposit, then return to flowers to feed on pollen. Supplementary feeding on flowers of different plants is essential for the survival of beetles. However, under laboratory conditions females emerging from pupal cells eventually laid eggs from which larvae hatched subsequently. Dissection of females that did not commence oviposition revealed 19 to 33 developed eggs in the ovaries. Weight of single freshly laid egg varied from 0.075 to 0.150 mg.

Various deciduous, rarely drying deciduous as well as recently dried trees are inhabited. Eggs are laid singly in cracks or under scales of bark, under plaques of lichen on trunks and shoots of trees, or on branches of shrubs. Oviposition commences in second half of June and continues as long as beetles live. Maximum number of eggs laid in July. Egg development continues for about three weeks. In 1968 we kept 98 eggs under observation under a forest canopy in Salair. At 18.5°C they developed in 21.5 ± 3.4 days. First larvae hatched in 16 days and last 30 days after oviposition. Larval hatching began mid-June and terminated in September. In 1968 of the 100 larvae which hatched in the forest in Salair the total was: 12 by July 20, 62—July 30, 74—August 10, 87—August 20, and 96—August 31 (Cherepanov and Cherepanova, 1975).

Larvae live under bark and make longitudinal, sometimes meandering galleries, impressed on alburnum. In standing trees galleries are usually made from bottom upward. Mature larvae move deeper into wood, make pupal cell longitudinal to trunk, and cut an exit from its upper end toward bark. Length of gallery under bark up to 32 cm, width before pupal cell 4.0 mm. Length of pupal cells 15 to 30 mm, width 4.0 to 5.0 mm. Larva pupates in pupal cell with head upward.

188 Formation of pupae begins end of May or beginning of June and

continues to beginning of July. Pupae found in maximum numbers middle or end of June. Pupal development continues for about two to three weeks, with development at 15.9°C under laboratory conditions completed in 13 to 16 days. Beetles acquire normal appearance three days after emergence, remain in pupal cell up to five to seven days, then cut round opening 3.0 to 4.0 mm in diameter on surface of trunk and emerge. Emergence of beetles from wood generally completed toward mid-July. Generation completed in two years, in isolated cases up to three years (Table 11). Weight records of 19 individuals showed: weight of larvae varies within a population from 20.0 to 73.5 mg, pupae from 18 to 63 mg, and adult insects from 12.5 to 45.1 mg. Weight of prepupa reached 173 mg [*sic*]. During metamorphosis weight decreases by 46.9% or more. Weight loss of larvae maximum in dry wood.

Table 11. Periods of development of *Chlorophorus gracilipes* (Fald.)

Year of development	April	May	June	July	August	September	October
1st	L	LP	LPA	AEL	AEL	EL	L
2nd	L	L	L	L	L	L	L
3rd	L	LP	LPA	AEL	AEL	EL	L

Chlorophorus gracilipes (Fald.) inhabits standing dry as well as fallen trees of many species. In laboratory experiments this species preferred linden over birch and choke-cherry. From larvae collected from cut forests in various regions, we raised 966 beetles: 257 from maple, 155 birch, 64 oak, 65 linden, 61 choke-cherry, 58 white ash, 47 elm, 40 hornbeam, 37 filbert, 24 hawthorn, 20 each willow, Manchurian walnut, and apple, 18 alder, 15 aarlia, 13 fir, 10 pear, eight juniper, seven each spindle tree and lilac, six grape, four mulberry, two each guelder rose and pine, and one each from common ash, currant, spiraea, pseudoacacia, spurge olive (*Daphne mezereum*) and *Micromeles alnifolia*. An inspection of forests further revealed the existence of larvae, pupae, and beetles of this species on trees of 21 different species (including larch and apricot), with maximum occurrence on linden, choke-cherry, and birch.

Chlorophorus gracilipes (Fald.) is often found on the same deciduous species of trees together with *Mesosa myops* Dalm., *Xylotrechus rusticus* L., *Rhagium mordax* Deg., and others. However, the former is mainly found on trunks and shoots with thin bark, the next two species in part on thick bark, and the last species in the basal zone of the trunk. Population density of *C. gracilipes* (Flad.) relatively high. As many as 24 to 32 larvae were counted in wood and under bark over a distance of 1.0

m on a dry trunk (linden, choke-cherry) up to 8.0 cm in diameter. This species does not inhabit viable or slightly stunted trees.

10. **Chlorophorus diminutus** (Bat.)

Bates, 1873, *Ann. Mag. Nat. Hist.*, vol. 12, p. 199 (*Clytanthus*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 480–481; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 85; Kojima and Okabe, 1960, *Food Plants of Japan. Cerambycidae*, vol. 33, p. 144 (*Rhaphuma*).

Adult (Figure 112): In body coloration and shape close to *C. gracilipes* (Fald.). Differs in characteristic pattern on elytra and other characters. 189 Head with minute dense punctation and thin, sparse, gray adherent hairs. Frons broad, broader and flat toward front, distinct lateral edges, smooth median line, and barely produced tubercle near base. Vertex insignificantly depressed. Eyes large, with large facets, and slightly notched. Antennae extend beyond middle of elytra (female), or almost reach posterior elytral slope (male). Third antennal segment almost 1.5 times longer than 4th.

Pronotum oblong, laterally rounded, narrows almost equally anteriorly and posteriorly, narrowly bent at anterior and posterior margins, with narrow posterior constriction and here laterally with white hairy border; disk uniformly convex, with dense uniform deep punctation, sparse, minute adherent grayish-brown hairs, and laterally near posterior angles stray long erect setaceous hairs. Scutellum flat, narrowly rounded posteriorly, with brownish adherent hairs.

Elytra with parallel sides, elongate, convex on disk, with rounded humeri, barely expressed flat depression on inner side of humeral tubercle, longitudinal depression on suture immediately behind scutellum, apex obliquely truncate, with sharply produced outer angle and rounded or slightly angular inner angle, with very minute dense punctation; short brownish, not very dense, and large, dense, compactly adherent white hairs form pattern characteristic of this species: longitudinal white stripe on suture behind scutellum; reduced transverse rounded band at posterior margin of anterior half; crossband behind middle which broadens insignificantly near suture; and broad white border at elytral apex.

Body ventrally with minute brownish adherent and light-colored stray semiadherent hairs. Episterna of meso- and metathorax and part of posterior margin of metasternum with dense white hairy coat. Abdominal sternites I to II which white hairy border that broadens significantly toward sides. Legs long and slender. Hind femora extend beyond elytral apex (male) or just reach it (female). First segment of hind tarsi almost 2.0 times length of two successive segments. Body, antennae, and legs black. Antennae, tibiae, and especially tarsi sometimes with lighter brownish or brownish-rust tinge. Body length 5.0 to 8.0 mm.

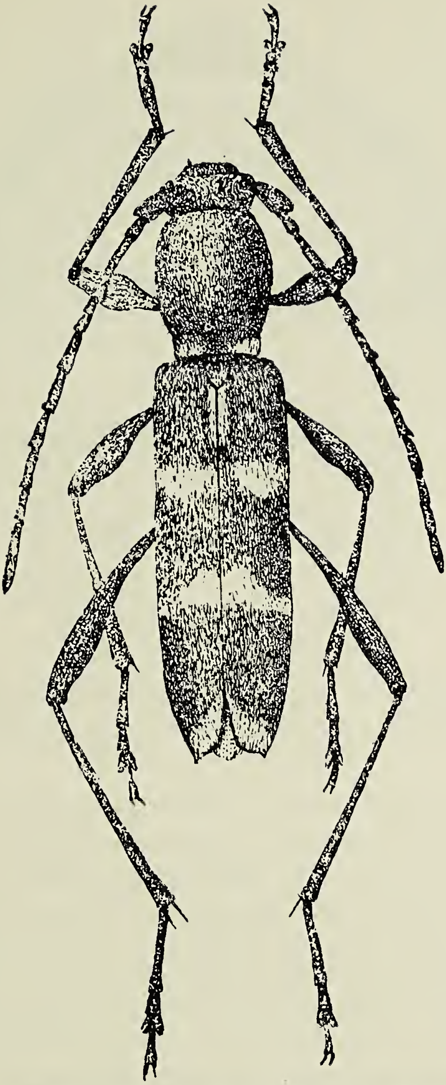


Figure 112. *Chlorophorus diminutus* (Bat.).

190 *Egg*: White, moderately elongate, narrowly rounded on poles, narrows gradually toward posterior pole and sharply toward anterior pole. Chorion with very fine, barely discernible, nonalveolate sculpture. Length 1.0 mm, width 0.6 mm.

Larva (Figure 113): Differs from other species in presence of ellipsoid produced process on sides of dorsal ampulla of abdominal tergite VI. Head markedly retracted into prothorax, narrows toward front. Epistoma flat, with barely perceptible notch on anterior margin, protruding anterior angles, and broad brownish border. Frontal sutures

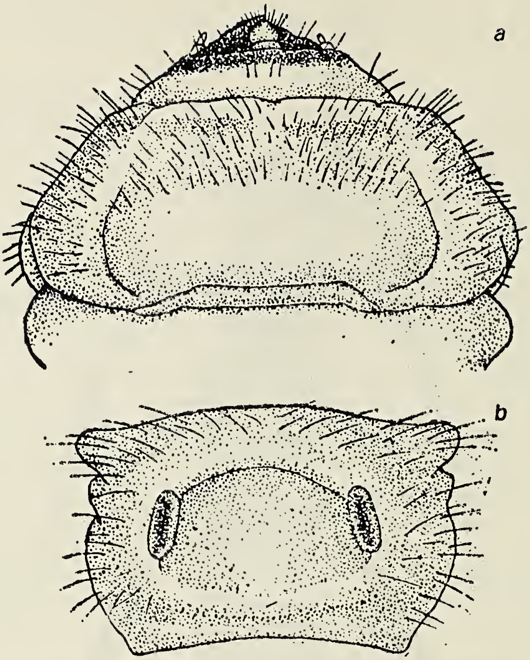


Figure 113. Larva of *Chlorophorus diminutus* (Bat.).
a—head and pronotum; b—abdominal tergite VI with
dorsal locomotory ampulla.

and median longitudinal suture not visible. Hypostoma narrows insignificantly toward front, with narrow rusty-brown border on anterior margin. Gular plate narrow, flat, whitish, and without rusty border on anterior margin. Parietals with thick rusty bristles in middle part, and broad whitish border on anterior margin. Antennae long, extend conspicuously beyond anterior margin of cephalic capsule. Clypeus protrudes slightly from under epistoma, with brownish tinge. Labrum whitish, narrowly (acutely) rounded at apex, with short light-colored bristles along margin. Mandibles black, broadly rounded at apex, and rusty-red at base. Labial mentum with parallel sides and long lateral bristles. Inner masticatory lobes of maxillae whitish, hyaline, and distinctly shorter than maxillary palps.

Pronotum narrows toward front, with broadly rounded anterior margin, two transversely elongate yellowish spots in anterior half of disk covered with hairs, one longitudinally elongate, lustrous, glabrous yellow spot on each side, and in anterior half before scutellum and laterally with light rusty hairs. Pronotal shield white, laterally bound by
191 longitudinal deep and curved grooves, more convex posteriorly and silvery-shagreen, leathery and lustrous in anterior half, with very minute

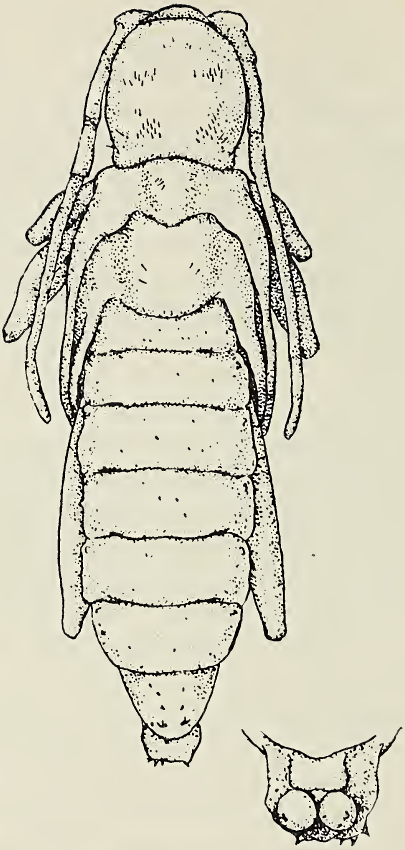
dense longitudinal streaks, and with transversely truncate or smoothly rounded anterior margin. Alar lobes on outer side of longitudinal grooves shagreen. Presternum slightly convex, on disk and sides with lightrusty hairs. Eusternum glabrous, leathery, with hairy clearance medially toward anterior margin. Thoracic legs lacking.

Abdomen narrows conspicuously from anterior to posterior end, laterally with light-colored, not very dense hairs. Dorsal locomotory ampullae moderately convex, shagreen, with fine sculpture, and transverse groove along anterior margin that curves backward on sides, from which sometimes indistinct short median longitudinal grooves originate. Dorsal ampulla of tergite VI with oval longitudinal ampullar process on each side. Abominal tergites matte ahead of transverse grooves. Ventral locomotory ampullae slightly convex, with broad median longitudinal depression and here with distinct constriction, matte, on disk with deep oblique grooves, toward front with short grooves curving inward. Body length of mature larvae 8.0 to 10.0 mm, width of head 1.2 mm.

Pupa (Figure 114): Readily distinguished from pupae of other species by very elongate body and poorly developed spinules on abdominal tergites. Head extends ahead of antennae, narrow and lustrous toward front, with barely produced tubercle on inner side near antennal base, transversely patterned longitudinal stripe toward front between antennae and on vertex, thin light-colored solitary bristles behind antennal base, and paired minute bristles anterolaterally on frons forming transverse row. Antennae flexed to sides, extend beyond abdominal tergite II (female) or III (male), with apices slightly bent ventrad.

Pronotum oblong, more elongate in male, disk convex, insignificantly and smoothly rounded laterally, with very narrow transverse groove at base; fine hard, almost acicular, rusty bristles form narrow medially interrupted transverse stripe on disk, one transversely elongate group near base at sides, mixed transverse row of narrow transverse stripe on anterior margin, and sparse field on anterior slope. Mesonotum barely produced on posterior margin, transversely depressed behind middle, and with isolated bristles along sides. Metanotum slightly convex, with narrow median longitudinal groove, sometimes with long solitary bristles along sides.

Abdomen very elongate, narrows insignificantly toward anterior and more toward posterior end. Abdominal tergites with narrow median longitudinal groove, and minute spinules forming three transverse rows: hind row consists of three to six spinules, middle row of two spinules shifted toward longitudinal groove, and front row with two to four very small, barely visible spinules. Sometimes spinules of front and even middle rows absent (especially on tergites I to II). Tergite VII triangular, narrowly rounded posteriorly, convex on disk; posterior margin



190 Figure 114. Pupa of *Chlorophorus diminutus* (Bat.), female.

with two to four large spinules bent forward, which form transverse row; pair of spinules ahead of row bent toward each other and form middle row; anterior half with two to four minute spinules that form front row. Tergite VIII thick, broadly rounded posteriorly; posterior margin with two to five spinules that form transverse row; disk with or without stray minute spinules. Valvifers of female with conically produced apical tubercles. Body length 6.0 to 9.0 mm, width of abdomen about 2.0 mm.

192 *Material*: Collected in Ussuri-Primor'e region. Adult insects 64, larvae 13, pupae—two males and four females, larval exuviae with beetles from pupal cells 20.

Distribution: Ussuri-Primor'e region; Japan. We found it mainly in forests in environs of Komarovka River.

Biology: Inhabits broad-leaved forests of the Far East. Associated with deciduous trees and shrubs. Beetles fly from May to mid-July, maximum in June, and visit flowers of various plants. They inhabit thin (1.5 cm in diameter) branches of hornbeam, oak, mountain elm, lilac, filbert, briar, and possibly other plants.

Larvae live under bark, make longitudinal galleries usually from apex toward base, deeply impressed in alburnum, and fill them compactly with frass; margins of gallery abrupt and sharp. Mature larvae penetrate wood, make longitudinal pupal cells in shoots, fill exit with frass, and pupate. Pupa lies in pupal cell with head toward exit. One larva on briar made a gallery 6.0 cm long under bark, from apex toward base, then turned back and continued gallery over an additional length of 10.5 cm directed apically, moved deeper into wood up to pith and made pupal cell transverse to branch. Length of pupal cell 8.0 to 25.0 mm, width 2.5 to 4.0 mm; width of exit 2.0 to 2.5 mm. Length of gallery under bark 6.0 to 16.5 cm, width up to 4.0 to 5.0 mm.

Pupation begins in first half of August and is completed at end of this month. Beetles emerge from pupae in August and September, overwintering in pupal cells. With the onset of warm weather in spring (May–June), they cut round openings up to 2.0 mm in diameter on surface of branches and exit from wood through them. Gonads of beetles emerging from wood underdevloped and hence supplementary feeding is required. Ovaries of one female dissected two days after its emergence from wood (in the laboratory) contained only one mature egg; other eggs were underdeveloped and looked like small thickenings in ovarioles. Generation completed in two years. First hibernation takes place at larval stage, second at adult stage (Table 12). Weight of individuals in a pupulation highly variable. Records of 27 individuals at different stages of development revealed: weight of larvae before pupation 6.3 to 23.0 mg, pupae 5.1 to 19.7 mg, and young beetles before hibernation 4.5 to 14.5 mg.

Chlorophorus diminutus (Bat.) damages thin branches of various trees and shrubs. We raised 45 beetles from larvae collected in the Ussuri-Primor'e region: 22 from hornbeam, 13 briar, six oak, two filbert, and one each from maple and lilac. An additional 23 insects (larvae, pupae, and beetles) were collected during an inspection of forests: 15 from

Table 12. Periods of development of *Chlorophorus diminutus* (Bat.)

Year of development	April	May	June	July	August	September	October
1st	A	AE	AEL	AEL	EL	L	L
2nd	L	L	L	LP	PA	PA	A
3rd	A	AE	AEL	AEL	EL	L	L

briar, three oak, four hornbeam, and one from elm. Sometimes this species is found together with *Anaesthetis confossicollis* Baeckm. on shoots of oak, and *Tetrops rosarum* Tsher. on shoots of briar.

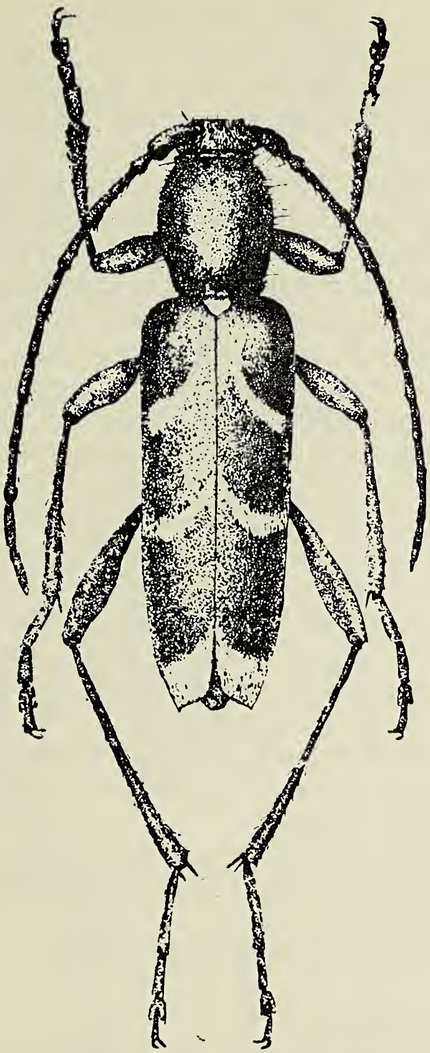
193 11. **Chlorophorus sartor** (Müll.)

Müller, 1766, *Mèlang. Soc. R. Turin*, vol. 3, p. 188 (*Leptura*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 483–485.

Adult (Figure 115): Differs from other species of *Chlorophorus* in punctation of pronotum, and presence of marginal, absence of humeral, white hairy spot on elytra. Frons broad, flat, with parallel sides, sometimes slightly notched only near eyes, distinct or barely perceptible edge on sides, with minute punctation and very dense gray hairs, slopes smoothly posteriorly, with barely produced tubercle near antennal base, smooth narrow median groove that extends almost from anterior margin and converts posteriorly into vertex. Eyes large, with minute facets, and broad but shallow notch. Antennae reach posterior crossband of elytra, or almost to white hairy border on elytral apex. First antennal segment equal to 5th, notably shorter than 3rd.

Pronotum equal to (male) or even less than (female) width in length, markedly rounded laterally, narrows notably more anteriorly and less posteriorly, bent more on posterior margin and less on anterior margin; disk hemispherically convex, slopes smoothly toward front and abruptly posteriorly, and covered with notchlike punctation; yellowish-gray adherent, comparatively sparse hairs do not form dense cover; sides of posterior margin sometimes with dense white adherent hairs that form short transverse border. Scutellum broad, semicircular, with dense white adherent hairs anteriorly.

Elytra convex on disk, not very elongate, with parallel sides, smoothly rounded humeri, truncate at apex, with spinelike elongate or pointed outer angle and rounded inner, barely perceptible smooth longitudinal notch on inner side of humeri; suture behind scutellum with indistinct longitudinal, very smooth depression covered with very minute dense notchlike punctation, with sparse brownish adherent hairs; sides behind humeral tubercle with small marginal white hairy spot; anterior half with white band extending from sides toward front in direction of scutellum; crossband behind middle broadens on sides, narrows near suture, and here curves forward; apex with broad white hairy border
194 that stretches angularly near suture. Hind femora extend beyond elytral apex. First segment of hind tarsi very long, much longer than all other segments together. Episterna of meso- and metathorax with dense white hairy coat. Abdominal sternites I and II with broad white hairy border on sides. Body black or with brownish tinge (f. *typica*), sometimes pronotum rusty (ab. *fulvicollis* Muls.), or tibiae, and partly tarsi, head, and



193 Figure 115. *Chlorophorus sartor* (Müll.).

pronotum rusty-red (ab. *ruficeps* Pic). Sometimes anterior band joins marginal spot (ab. *progressivus* Plav.) or divides into two longitudinal spots (ab. *infensus* Plav.).

Distributoin: Mediterranean Sea to the Baltic, Middle Volga, the southern Urals. Known in Siberia to Khabarov. However, we did not find it there.

Biology: Inhabits deciduous forest plantations. Emergence of beetles begins in June and terminates in mid-August. Larvae live in wood of false acacia, chestnut, and other deciduous trees (Plavil'shchikov, 1940).

8. Genus *Rhaphuma* Pasc.

Pascoe, 1858, *Trans. Ent. Soc. Lond.*, 2, 4, 240; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 491–493; Mamaev and Danilevskii, 1975, *Lichinki zhukov-drovosekov*, p. 215.

Adult: Body elongate. Antennae thin, almost reach elytral apex (male) or slightly shorter (female). Pronotum oblong, with median longitudinal carina. Elytra elongate, with straight or smooth cut at apex, and produced under angle; covered with light-colored adherent hairs forming characteristic pattern of longitudinal oblique bands (stripes). Legs very long, slender; hind femora reach or slightly short of elytral apex.

Larva: Differs from those of other species in epistoma anterolaterally truncate, without medial notch near clypeus, and generally protrudes forward. Sides of head with one ocellus each near antennal base. Pronotal shield leathery, white, covered with longitudinal coarse wrinkles. Thoracic legs poorly developed, brownish-rust, apically sclerotized. Locomotory ampullae convex, developed on abdominal segments I to VII, with longitudinal striate wrinkles, without transverse grooves.

Pupa: Readily identified by oblong body. Antennae slender, bent looplike, with apices flexed to ventral side. Pronotum oblong, with thin rusty bristles forming median crossband, individual groups on sides and posterior slope, and jumbled transverse row on anterior margin. Abdominal tergites in posterior half with numerous spinules. Abdominal tergite VII with four to six spinules on posterior margin, disk with paired spinules bent toward each other.

One species of the genus *Rhaphuma* Pasc. is known is USSR fauna. The fauna of southeast Asia is richest in species of this genus, with more than 30 species described.

Type species: *Rhaphuma placida* Pascoe, 1858.

1. **Rhaphuma acutivittis** (Kr.)

Kraatz, 1879, *Deutsch. Entom. Z.*, vol. 23, p. 111 (*Clytus*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 493–496; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 287; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 86 (*Hayashiclytus*); Kojima and Okabe, 1960, *Food Plants of Japan. Cerambycidae*, p. 144; Cherepanov and Cherepanova, 1974, *Usachi vinograda amurskogo*, pp. 51–57; Cherepanov and Cherepanova, 1975, *Zhuki-drovoseki ivovykh lesov Sibiri*, pp. 115–119.

195 *Adult* (Figure 116): Body thin, elongate. Head with fine dense punctation, produced tubercle on inner side near antennal base, median longitudinal groove, with dense adherent yellowish or white and long thin erect light-colored hairs. Eyes large, notched on inner side. Antennae slender, reach apex (male) or posterior margin of second third (female)

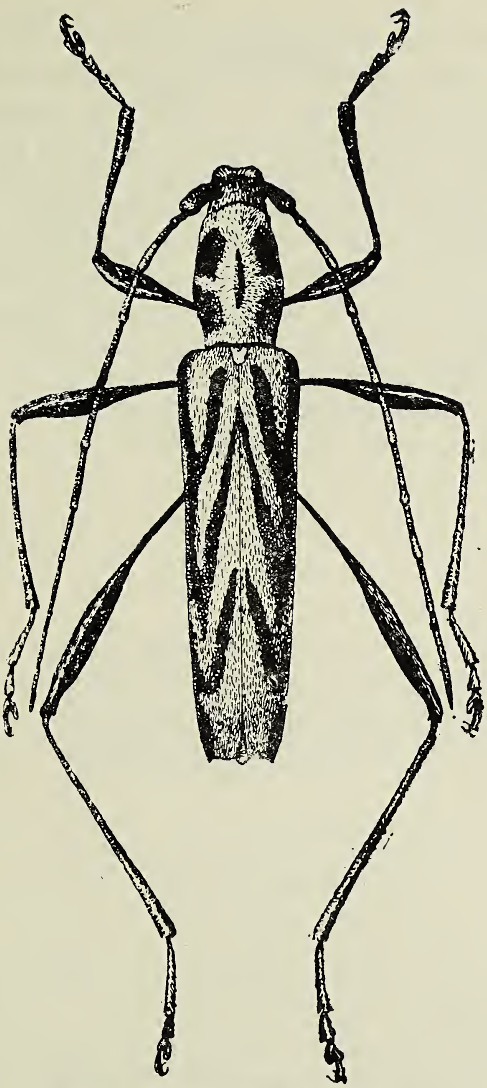


Figure 116. *Rhaphuma acutivittis* (Kr.).

of elytra First antennal segment thick, rounded apically; 3rd segment equal to 5th, and distinctly longer than 4th.

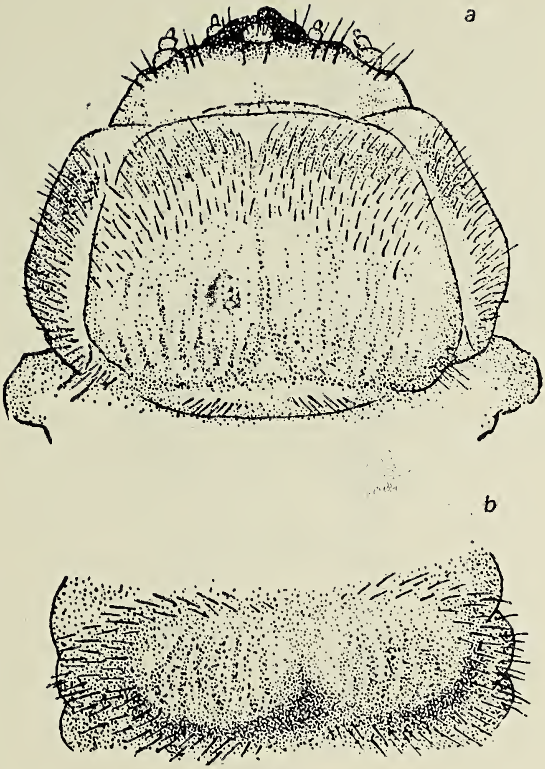
Pronotum oblong, barely narrows toward anterior and posterior ends, with medium longitudinal glabrous carina in posterior half, with dense rugose punctation; covered with dense yellowish compact hairs directed backward in anterior half; sides with round glabrous coarse black punctures; and covered with sparse erect light-colored hairs. Scutellum not longer than wide, broadly rounded anteriorly, and with dense adherent hairs.

Elytra narrow, with parallel sides, markedly elongate, broadly truncate at apex or slightly notched, with produced outer angle; fine adherent hairs form characteristic pattern of oblique longitudinally elongate narrow bands (stripes) of yellowish or grayish tinge: longitudinal straight stripes near humeral tubercle and on sides, and broad spot at apex. Legs very long, slender; femora minutely clavate with long shaft. Hind femora reach (male) or do not reach (female) elytral apex. Hind tarsi 0.66 length of tibia, 1st segment 2.0 times length of two successive segments. Body ventrally with white, comparatively sparse, adherent hairs. Episterna of meso- and metathorax and sides of abdominal sternites with denser hairs. Thorax additionally with dense, abdomen with sparse setaceous semierect hairs. Body black, elytra sometimes with brownish tinge. Antennae rusty; 1st segment dark brown. Femora black, sometimes with rusty tinge in proximal region; tibiae brownish-rust; tarsi light rust. Body length 12 to 19 mm.

Egg: With chocolate-brown tinge, moderately elongate, narrows more
196 abruptly toward anterior, smoothly toward posterior pole, and narrowly rounded or pointed at poles. Chorion with fine alveolate sculpture, matte. Length 1.5 mm, width 0.7 mm.

Larva (Figure 117): Head markedly retracted into prothorax, barely narrows toward front. Epistoma insignificantly truncate anterolaterally, protrudes forward medially, with narrow dark brown border, disk transversely convex, slopes toward front, and depressed anteriorly. Median longitudinal and frontal sutures not visible. Hypostoma smooth, lustrous, broadens toward front, with very narrow brownish border on anterior margin, and usually rusty-brown at posterior truncate margin of sclerites. Gular plate transverse. Parietals with rusty-brown border on anterior margin that does not extend backward beyond ocellar-antennal area, with thin sparse hairs in middle, and one hyaline or sparsely pigmented ocellus near antennae. Antennae long, extend far beyond anterior margin of cephalic capsule. Clypeus very short, protrudes from under anterior margin of epistoma as a narrow strip. Labrum convex, broadly rounded, with rusty bristles in anterior half. Mandibles convex on outer side, lustrous, with broad transverse groove closer to base.

Pronotum slopes markedly toward head, narrowly rounded anteriorly, with two indistinct rusty transverse spots in anterior third, small notch on anterior margin, one distinctly depressed spot on each side, with uniform rusty hairs in anterior half of disk and on sides. Pronotal
197 shield white, leathery, convex at base, bound laterally by deep longitudinal grooves that extend almost up to anterior margin of pronotum, with deep longitudinal streaks, and median longitudinal groove. Presternum with dense rusty hairs, which are longer near anterior angles. Eusternum glabrous, leathery, lustrous, in middle part toward front



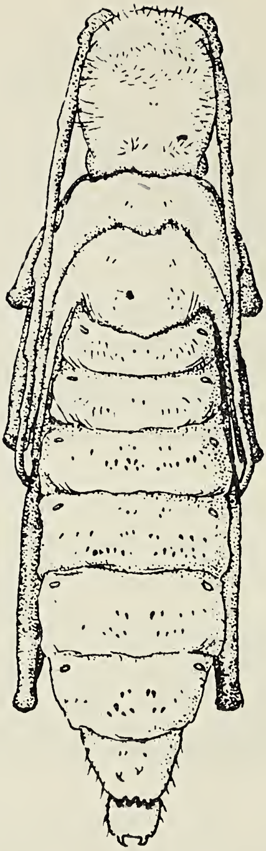
196 Figure 117. Larva of *Rhaphuma acutivittis* (Kr.).
a—head and pronotum; b—abdominal tergite with
dorsal locomotory ampulla.

sometimes divided by longitudinal hairy field. Thoracic legs very small, caruncular.

Abdomen laterally with short sparse light-colored hairs. Dorsal locomotory ampullae sufficiently convex, with common median longitudinal groove, leathery, with oblong striate wrinkles. Ventral locomotory ampullae similar in structure, without transverse groove. Body length of mature larvae 19 to 20 mm, width of head 2.0 to 2.3 mm.

Pupa (Figure 118): Body very elongate, head narrows toward front of eyes, elongate, with channel-shaped longitudinal groove between antennae, flat on vertex, broadly rounded on occiput, and with stray, barely visible bristles along sides of frons. Antennae slender, bent looplike in second half, with apices flexed to ventral side at level of midfemora.

Pronotum oblong, smoothly rounded laterally, with barely bent posterior angles; disk uniformly convex, smooth, or with distinct transverse streaks, with thin piliform bristles forming median transverse



196 Figure 118. Pupa of *Rhaphuma acutivittis* (Kr.).

stripe, small group on posterior slope and on each side before posterior angles, and jumbled transverse row near anterior margin. Mesonotum slightly convex, transversely depressed behind middle, with barely produced shield on posterior margin, and laterally with or without solitary bristles. Metanotum flat or slightly convex, with median longitudinal groove (indistinct in some); laterally with stray minute bristles, sometimes forming small group on each side in posterior half.

Abdomen elongate, narrows gradually or more abruptly toward posterior end. Abdominal tergites convex, with median longitudinal groove; posterior half with sharp or obtuse spinules forming transverse row; paired spinules medially along sides of longitudinal groove form middle transverse row; anterior half with very minute spinules, closer to anterior margin, forming anterior transverse row, or without them. Tergite VII oblong or transverse, narrowly rounded posteriorly; posterior margin with four to six large spinules bent forward, which form posterior transverse row; ahead of this row disk with two spinules behind middle bent inward, which form middle transverse row; anterior half with two very small spinules, forming transverse row, or without them. Tergite VIII elongate, posteriorly with (male) or without (female) pair of spinules bent toward each other. Hind tibiae extend beyond abdominal tergite V. Valvifers of female large, hemispherical, compact, shifted, and apically covered with coarse wrinkles. Body length 13 to 19 mm, width of abdomen 3.0 to 4.0 mm.

Material: Collected in Ussuri-Primor'e region. Adult insects 753, larvae 110, pupae 16, larval exuviae with beetles from pupal cells 14.

Distribution: Ussuri-Primor'e region, southern Sakhalin; northeast China, Korean Peninsula, Japan. Found in large numbers in forests of Ussuri, Khasan, Shkotovo, Partizan, and other regions of southern Primor'e.

Biology: Inhabits broad-leaved forests of the Far East. Ecologically associated with many deciduous trees. Beetles emerge from early June almost up to end of August. Appear in small numbers end of June and
198 in July. They visit flowers of Umbelliferae, Rosaceae, Asteraceae, and other plants to collect pollen. More active in clear warm weather. After feeding, they fly to trees inhabited by them, mate, and oviposit in bark or wood crevices. They live on trunks and thick branches of desiccated but usually standing trees, predominantly maple, rarely other deciduous trees. One female can lay more than 30 eggs. Incubation period three to four weeks. For example, at 19.9 ± 0.5°C the egg stage continues for 27 to 30 days (average 27.5 days), and at 21.5 ± 0.8°C for 17 to 21 days (average 20 days). Hatching of larvae completed by mid-September.

Larvae bore wood, leaving entrances up to 0.5 mm in diameter on surface filled with white frass. They live only in wood (not found under bark) in surface layer up to a depth of 10 mm, make longitudinal galleries, and fill them with fine frass. Sometimes galleries (usually under alburnum) are so numerous that a continuous ring forms in a cross section of the trunk. Larvae hibernate three times. After the third hibernation they make a pupal cell at end of gallery longitudinal to trunk, cut an outlet from cell on surface of trunk, fill it with frass, and pupate with head facing exit. Length of pupal cell 21 to 40 mm, width 4.0 to 6.0 mm. Thickness of layer of wood between pupal cell and bark 8.0 to 15.0 mm.

Pupation begins in first half of May and terminates toward end of the month. Young beetles emerge from pupae after three weeks at 20.1 ± 0.7°C. They remain in the pupal cell for seven days, then remove frass from exit, cut round openings 3.0 to 5.0 mm in diameter on surface of trunk and emerge. Emergence of beetles from wood begins in early June and terminates mid-July. Mass emergence observed in third 10 days of June. Young beetles require supplementary feeding, although they can mate and oviposit even without it. However, under such conditions their biological potential for reproduction is not fully realized. Complete cycle of development requires more than three years (Table 13). Records of 28 individuals at different phases of development showed: weight of larvae before pupation ranged from 47.0 to 149.5 mg, pupae 42.0 to 136.4 mg, and young beetles before emergence from wood 35 to 106 mg. Sometimes larvae of first, second, and third years after emergence are found on the same trees. For example, the weight of a single larva at a young age was 7.7 mg, at middle age 33.2 to 40.0 mg, at old age 103.6 mg, and one beetle 75.6 mg. This indicates that trees are inhabited repeatedly and, consequently, the population density on a tree may increase with time and its age structure become heterogeneous.

Table 13. Periods of development of *Rhaphuma acutivittis* (Kr.)

Year of development	April	May	June	July	August	September	October
1st	L	LPA	LPA	AEL	AEL	EL	L
2nd	L	L	L	L	L	L	L
3rd	L	L	L	L	L	L	L
4th	L	LPA	LPA	AEL	AEL	EL	L

199 *Rhaphuma acutivittis* (Kr.) develops on many deciduous trees, but prefers maple and partly hornbeam. For example, 705 beetles were raised from larvae collected from lopped trees under natural conditions: 510 from maple, 97 hornbeam, 30 pear, 11 grape, 10 oak, nine white ash, six each elm and guelder rose; five each mulberry and willow; four each alder and birch, three aralia, and one each from apricot, spindle tree, Manchurian walnut, choke-cherry, and filbert. In addition, 216 larvae, pupae, and beetles were found in wood: 100 on maple, 45 hornbeam, eight white ash, seven pear, and so forth. Sometimes *Rosalia coelestis* Sem. was also found on Manchurian striped maple.

9. Genus *Teratoclytus* Zaitz.

Zaitzev, 1937, *Trav. Mus. Zool. Ac. Sc. Ukraine*, vol. 19, p. 213; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 496; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed., p. 24; Mamaev and Danilevskii, 1975, *Lichinki zhukov-drovosekov*, pp. 215–216.

Adult: Antennae long, slender, filiform, 2.0 times body length in male, with 10th segment reaching beyond elytral apex in female, and white densely hairy ring on 6th segment. Pronotum slightly oblong, with longitudinal white hairy stripe in middle of posterior slope. Elytra light rusty, with oval dark brown, almost black large spot in posterior third, white border on inner side of apex, white curved narrow hairy bands before middle with minute adherent white hairs between them, forming characteristic rhomboid pattern.

Larva: Differs from larvae of other genera in hexagonal, longitudinally patterned labial submentum, with its base located between sclerites of hypostoma. Thoracic legs matte, poorly developed. Locomotory ampullae leathery, rugulose.

Pupa: Characterized by presence of long slender antennae, bent looplike in second half, ventrad and forward. Pronotum oblong, disk convex, with rusty bristles forming wide group on posterior slope before posterior angles and transverse stripe on disk. Abdominal tergites with large bristles on posterior margin and minute bristles toward front. Tergite I without spinules, with only small stray bristles.

The genus *Teratoclytus* Zaitz. is found in the eastern regions of Asia, and significantly differs morphologically from other genera of Clytini, not only at the adult stage but also in the preimaginal. It is a monotypic genus.

Type species: *Teratoclytus plavilstshikovi* Zaitzev, 1937.

1. **Teratoclytus plavilstshikovi** Zaitz.

Zaitzev, 1937, *Trav. Mus. Zool. Ac. Sc. Ukraine*, vol. 19, p. 213; Plavil'shchikov. 1940, *Fauna SSSR*, 22, 2, 497–498; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 81; Cherepanov and Cherepanova, 1975, *Usachi vinograda amurskogo*, pp. 41–46.

Adult (Figure 119): Head with spinelike, produced tubercle on inner side between antennae, and short median longitudinal groove. Frons broad, even, with lustrous, dense punctation, and covered with sparse short hairs. Vertex flat behind suspended sloping posterior margin of frons, covered with large dense punctation. Eyes small, convex, reniform, barely notched on inner side, and with fine sharp facets. Antennal bases shifted toward middle. Antennae slender, filiform, in male 2.0 times
200 longer than body, in female with 10th segment reaching beyond elytral apex. First antennal segment stout, others slender.

Pronotum oblong, smoothly rounded laterally, with stray erect hairs or glabrous, with smooth narrow border on anterior and posterior margins, disk uniformly convex, with fine very dense punctation imparting matte texture, and white longitudinal hairy stripe in middle of posterior slope. Scutellum transverse, broadly rounded posteriorly, with median longitudinal depression, and dense white hairs.

Elytra narrow from base toward apex more in male, less in female, notably broaden at humeri, with completely rounded apex, broadly and

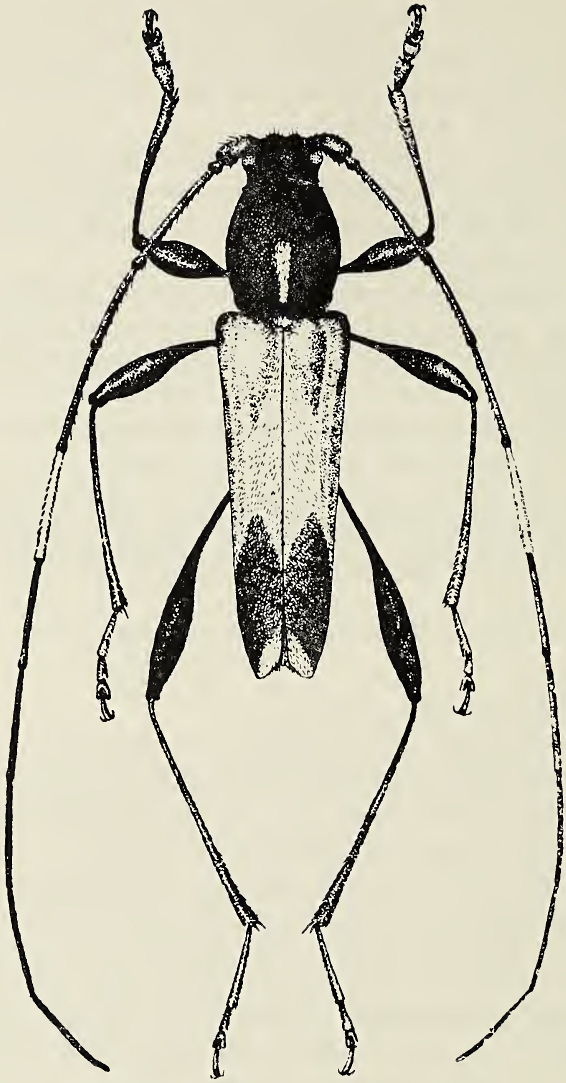


Figure 119. *Teratoclytus plavilstshikovi* Zaitz.

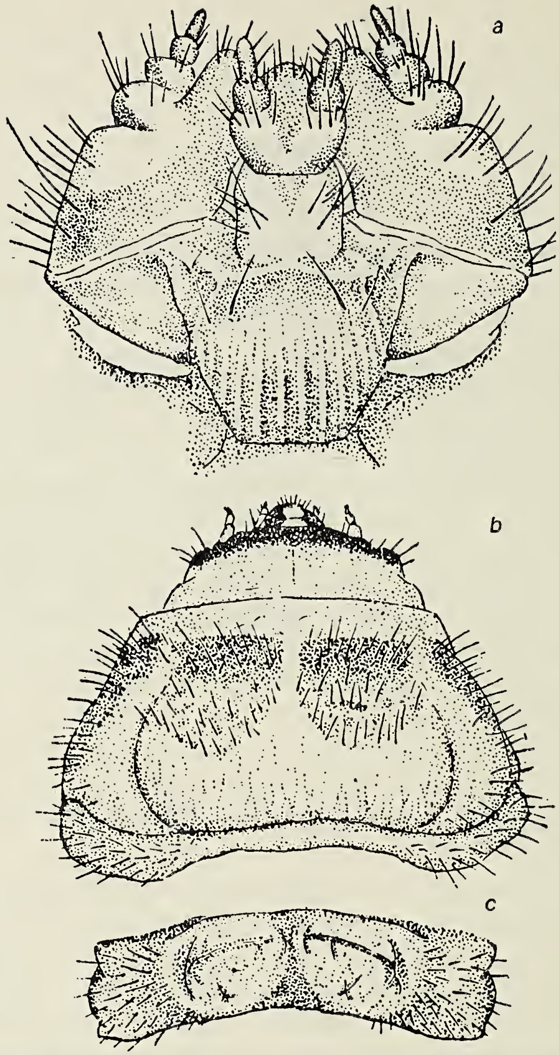
insignificantly depressed before middle of disk, with fine dense punctation, and adherent brownish and white hairs forming characteristic pattern. Legs long, slender; femora smoothly clavate with long shaft, hind femora extend beyond elytral apex (male) or barely reach it (female). First segment of tarsi longer than all other segments together. Episterna of thorax, pro- and mesosternal sclerites, and abdominal sternites I to II covered with dense white adherent hairs. Body black. Antennae rusty, 6th segment with dense hairy, contrasting broad white ring. First antennal segment wtih dark brownish tinge. Legs rusty, femoral clava dark brown. Elytra light rust, with large oval dark brown spot in posterior third, two narrow white hairy curved bands: one band extends from scutellum backward toward sides, the other behind middle encircles dark brown oval spot. Space between these bands covered with sparse adherent white hairs, imparting rhomboid pattern. Elytral apex near inner angle with white hairy border. Body length 8.0 to 13.0 mm.

Egg: White, elongate, rounded at poles. Chorion smooth, lustrous, translucent, without distinct sculpture. Length 1.8 mm, width 0.5 mm.

Larva (Figure 120): Half of head retracted into prothorax. Epistoma almost flat, slightly convex near anterior margin, with rusty-brown, sharply patterned border on back side, and brownish median suture in
201 posterior half. Frontal sutures not visible. Hypostoma narrows slightly toward front, with shifted sclerites, between which labial submentum inserted from frontal side. Gular plate very short, transverse. Parietals with broad rusty-brown border covering ocellar-antennal area, and here extends ligulately on ventral side near antennal base; one hyaline or sparsely pigmented ocellus located on facial side of ligulate extension. Antennae comparatively slender; 2nd segment extends beyond anterior margin of cephalic capsule. Clypeus short, transverse, trapezoid, and with brownish tinge. Labrum not broader than clypeus, convex, broadly rounded on anterior margin, with short light-colored hairs. Mandibles with longitudinal groovelike notch near base on outer side, broadly rounded at apex. Labial submentum hexagonal, protrudes far between hypostomal sclerites, rusty-brown, light-colored only on anterior margin, and with deep longitudinal streaks (larva differs in this respect from all other species).

Pronotum distinctly narrows anteriorly, markedly slopes toward head with two transverse rectangular rusty spots in anterior third, sides with broad rusty spot, and disk and sides with uneven thin light rust hairs. Pronotal shield moderately convex, white, leathery, with longitudinal wrinkles, bound by longitudinal and slightly elongate grooves. Presternum uniformly convex, with rusty and not very dense uniform hairs. Eusternum glabrous, leathery, without hairs. Thoracic legs short, poorly developed, at apex rusty-brown, sclerotized, and with barely perceptible claw.

Abdomen elongate, narrows slightly and gradually toward posterior end, and laterally with sparse short light-colored hairs. Dorsal locomotory ampullae leathery, rugulose, divided by common median longitudinal groove, with two transverse grooves that laterally join short longitudinal folds. Sometimes posterior transverse groove faint or not at all visible. Ventral locomotory ampullae divided by median transverse groove that curves backward laterally, from which short longitudinal wrinkles originate, although latter sometimes indistinct. Length of mature larvae



202 Figure 120. Larva of *Teratoclytus plavilstshikovi* Zaitz.

a—head, ventral view (labium and maxillae): b—head and pronotum; c—abdominal tergite with dorsal locomotory ampulla.

13 to 16 mm, width of head 1.8 to 2.0 mm.

Pupa (Figure 121): Body moderately elongate. Head slightly convex near antennal base, with channel-shaped median longitudinal groove, without spinules and bristles, and uniformly rounded on vertex and occiput. Antennae flexed to sides, in second half looplike and bent forward on ventral side, with apices adjoining forefemora (male) or midtibiae at level of midcoxae (female).

Pronotum uniformly convex, slightly oblong, slightly broadly rounded laterally, with narrow transverse groove near base, and with thin transverse streaks or without them; rusty bristles form one wide group on posterior slope before posterior angles; second group in middle forms transverse stripe (in some insects this stripe is reduced or medially interrupted); third group in anterior half not so dense, sometimes comprises single bristles forming transverse row. Mesonotum almost flat, widely depressed behind middle and here with thin bristles along sides, and with smoothly produced shield on posterior margin. Metanotum slightly convex, with median longitudinal groove, and with stray very minute bristles in posterior half.

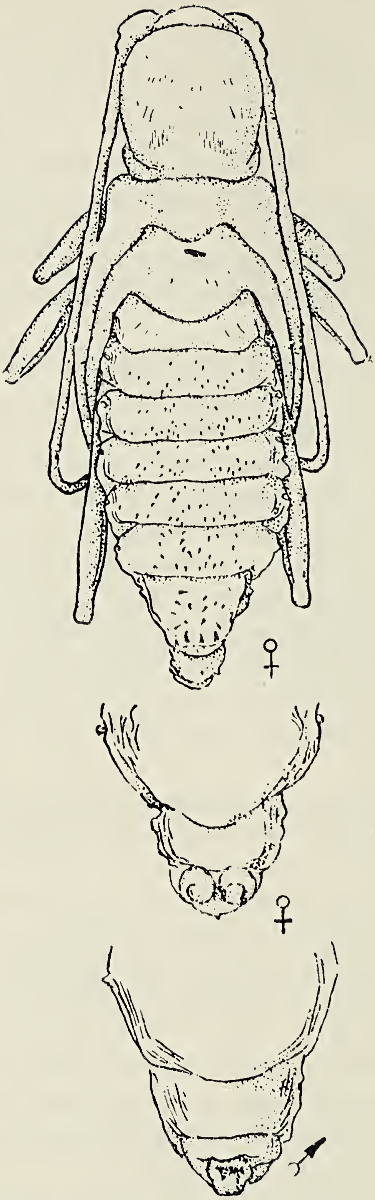
Abdomen narrows slightly anteriorly, more markedly posteriorly. Abdominal tergites with narrow median longitudinal groove, on poste-
202 rior margin with large spinules forming jumbled transverse row, and small spinules forming transverse row in middle and transverse row closer to anterior margin. Abdominal tergite I without spinules, only with stray bristles. Tergite VII narrows posteriorly, rounded on posterior margin and here with four to five large spinules bent forward forming transverse row; disk with spinules of slightly smaller size bent backward medially, forming common spinescent field. Tergite VII transverse, broadly rounded posteriorly, on posterior margin with stray sharp spinules, or without them. Valvifers of female hemispherical, contiguous, and with produced apical tubercle. Body length 10 to 15 mm, width of abdomen 3.5 to 4.0 mm.

Material: Collected in Ussuri-Primor'e region, from Sakhalin Island. Adult insects 359, larvae 57, pupae—seven males and females, larval exuviae with beetles from pupal cells 14.

203 *Distribution*: Ussuri-Primor'e region, southern Sakhalin; Japan. We found it in forests in Ussuri, Shkotovo, Khankai, Khasan, and other regions of Primor'e territory. Found in large numbers here and there.

Biology: Inhabits broad-leaved and mixed forests in which grape also grows. Beetles appear end of May and up to July, do not visit flowers, remain on vines of grape, where mating and oviposition take place. One female can lay up to 28 eggs in her lifetime. Eggs are laid singly under peeling layers of bark. Embryonic development at 19.8 to 22.6°C continues for two to three weeks.

Fully formed larvae bore into vine, make longitudinal galleries first under bark and then in wood (in thin vines along pith), and fill them with fine frass. Hibernation takes place twice. In autumn before or after second hibernation larva makes pupal cell in wood longitudinal to vine, cuts exit at end of pupal cell toward surface of vine (sometimes layer of wood up to 1.0 mm thick remains between outlet and bark), fills it with frass, and pupates with head toward outlet. Length of gallery in



202 Figure 121. Pupa of *Teratoclytus plavilstshikovi* Zaitz.
(tip of abnomen, ventral view, female and male).

wood 8.0 to 15.0 cm, width 5.0 to 6.0 mm. In thick vines up to 4.0 cm in diameter, pupal cells are made in wood at depth of 10 to 15 mm and in thin branches up to 8.0 mm in diameter in pith. Length of pupal cell 20 to 25 mm, width 4.0 to 5.0 mm. Length of outlet from pupal cell about 6.0 mm.

Pupation begins in first half of May and terminates mid-June. Pupae found to end of June and develop in 2.5 to 3.0 weeks. For example, development of pupae under natural conditions with an average daily temperature of 17.5°C continued for 18 days, while in the laboratory at 16.4°C it was completed in 24 days. Emergence of beetles from pupae begins end of May and terminates end of June. Mature beetles removes frass from outlet after five to seven days, cuts round opening 2.5 to 4.0 mm in diameter on surface, and exits from pupal cell. Mass emergence of beetles from wood observed in second half of June. Complete cycle of development takes two years (Table 14). Weight of 21 larvae before pupation ranged ftom 20 to 119 mg, pupae 18.0 to 108.3 mg, and young beetles before emergence from wood 15.0 to 93.3 mg. Dwarfed insects usually form in dead branches of dry wood and minimum moisture content.

Table 14. Periods of development of *Teratoclytus plavilstshikovi* Zaitz.

Year of development	April	May	June	July	August	September	October
1st	L	LPA	LPAE	PAEL	EL	L	L
2nd	L	L	L	L	L	L	L
3rd	L	LPA	LPAE	PAEL	EL	L	L

In the Ussuri-Primor'e region *Teratoclytus plavilstshikovi* Zaitz. is found in large numbers and together with other long-horned beetle species [*Brachyclytus singularis* Kr., *Phymatodes maaki* (Kr.), *P. ussuricus* Plav.] causes serious damage to plantations of wild grape (*Vitis amurensis*). We raised 328 beetles from larvae collected in a forest with wild grape. Not found on other trees.

204 10. Genus *Paraclytus* Bat.

Bates, 1884, *J. Linn. Soc. Lond. Zool.*, vol. 18, p. 324; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 499–501; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 302; Mamaev and Danilevskii, 1975, *Lichinki zhukov-drovosekov*, pp. 216–217.

Adult: Characterized by a comparatively long 4th antennal segment, barely shorter than 3rd; convex and compactly punctate pronotum, narrow and long episternum of metathorax, short hind tarsi, and other characters.

Larva: Thoracic legs well developed. Longitudinal (medial) suture of epistoma not visible. One ocellus located on each side of head near antennal base. Pronotum in anterior third with pair of transverse and distinctly notched rusty or rusty-yellow spots on anterior margin. Pronotal shield convex, matte silver at base, with fine longitudinal pattern toward front. Locomotory ampullae of abdomen matte shagreen, with silvery tinge.

Pupa: Body elongate. Antennae looplike, bent in second half, with apices ventrad and adjoining hind tibiae. Pronotum with minute stray bristles. Abdominal tergites with sharp spinules directed backward, among which paired spinules (in group of two adjoining each other) either paramedial on tergites, or on both sides near longitudinal groove.

The genus *Paraclytus* Bat. is found occasionally in Eurasia. The species are comparatively local in distribution. Only one species is known in the fauna of northern Asia, which inhabits deciduous forests in islands of the Far East.

Type species: *Paraclytus excultus* Bates, 1884.

1. **Paraclytus excultus** Bat.

Bates, 1884, *J. Linn. Soc. Lond. Zool.*, Vol. 18, p. 234; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 507–509; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 88; Krovolutskaya, 1973, *Entomofauna Karil'skikh ostrovov*, p. 105.

Adult (Figure 122): Differs from other species of the tribe in relatively long antennae, and structure and pattern of elytra. Head with dense uneven punctation, white adherent hairs, tubercularly raised near antennal base, with short median longitudinal groove, flat on frons ahead of antennae, and broadly depressed on vertex. Antennae long, reach posterior slope (female) or apex (male) of elytra, with sparse adherent hairs, and bristles on lower side of 2nd to 5th, partly 6th segments. Third antennal segment longer than 4th, equal to 5th. Eyes minutely faceted, broadly notched on inner side, and with narrow upper lobe.

Pronotum barely oblong, broadly rounded laterally, behind middle sometimes angularly produced on sides, convex, with very dense punctation, small transverse groove near anterior and on posterior margin, latter with turned margin, and characteristic tubercle on median line before posterior slope; adherent hairs directed toward tubercle on disk form median longitudinal white stripe; sides with additional thin erect hairs. Scutellum elongate, triangular, pointed anteriorly, and with dense punctation.

Elytra with parallel sides, convex, depressed on inner side of humeri

and on suture behind scutellum, with protruding tubercle at base between depressions, very fine dense punctation, and adherent brownish
205 hairs; with hairy whitish pattern: suture throughout its length, crossband from suture to middle of disk (located at junction of anterior and posterior elytral halves); second crossband extends toward front before posterior slope, and hairy white apex; notches near humeri and behind scutellum; obliquely elongate spot on sides in anterior half with white adherent hairs. Legs slender; hind femora barely reach posterior elytral slope, hind tarsi about 0.50 length of tibiae. First segment of hind tarsi barely longer than two successive segments together. Body ventrally with dense white adherent and sparse long semiadherent hairs. Body length 10 to 15 mm.

Egg: White, slightly elongate, narrows more toward one pole, narrowly rounded at posterior pole and broadly rounded at anterior one. Chorion smooth, lustrous. Length 11 mm, width 0.6 mm.

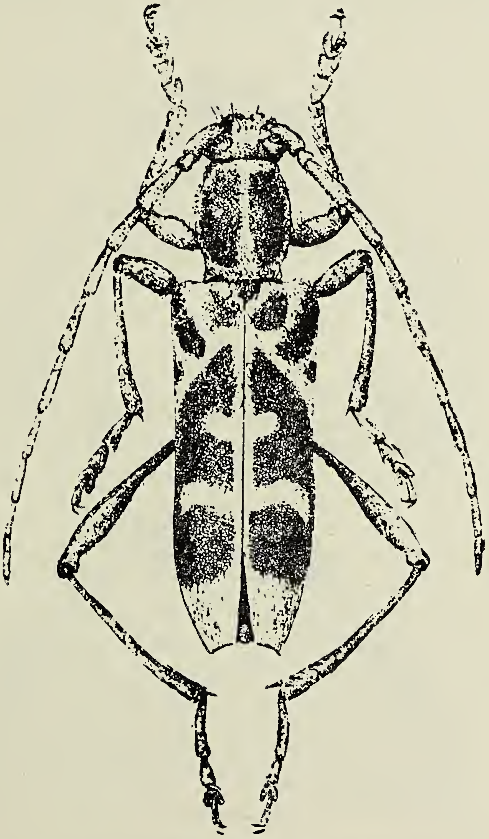
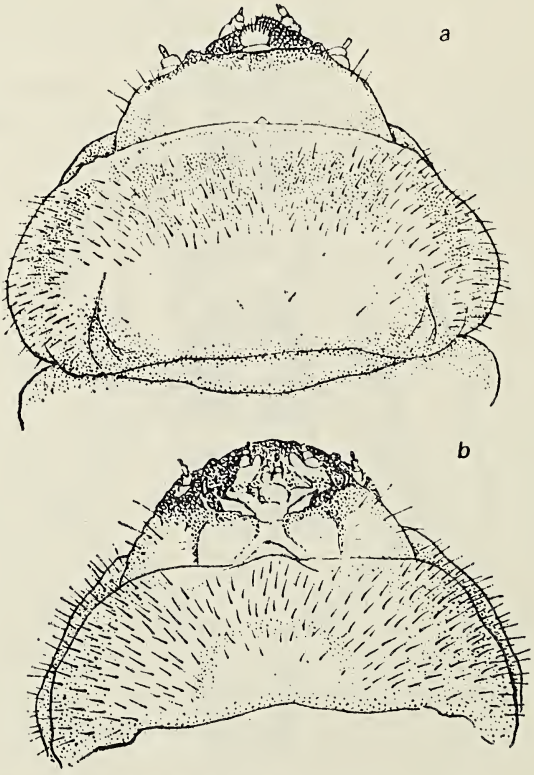


Figure 122. *Paraclytus excultus* Bat.

Larva (Figure 123): Similar to larva of *Cyrtoclytus capra* (Germ.). Differs in presence of well-developed thoracic legs. Head narrows slightly toward front, half its length retracted into prothorax. Epistoma slightly elongate, whitish, fused laterally with parietals, frontal sutures not visible, with dark brown smooth border on anterior margin, and divided by dark brownish indistinct median longitudinal suture. Hypostoma in anterior half with thin transverse, very dense streaks that convert into anterior margin of genae. Gular plate between them with almost parallel sides, and narrow rusty borders. Sclerites of hypostoma abruptly rounded on posterior inner margin; parietals at anterior margin with broad and relatively sharply protruding rusty-brown border that covers ocellar-antennal area from behind in form of continuous stripe. Hind margin of this stripe with long thin hairs. Third segment of antennae extends beyond anterior margin of cephalic capsule; 1st segment very stout, subsequent segments half thickness compared to previous ones. Small ellipsoid ocellus near antennal base. Labrum small, almost triangular, narrowly rounded at apex, and with short light-colored bristles



206 Figure 123. Larva of *Paraclytus excultus* Bat.
a—head and pronotum; b—head and prosternum.

along margins. Mandibles black, on outer side convex and smooth, with narrow transverse groove, and reddish sharply turned base. Inner masticatory lobes of maxillae hyaline in second half, broadens toward apex, with short bristles on outer side at end, and barely shorter than maxillary palps.

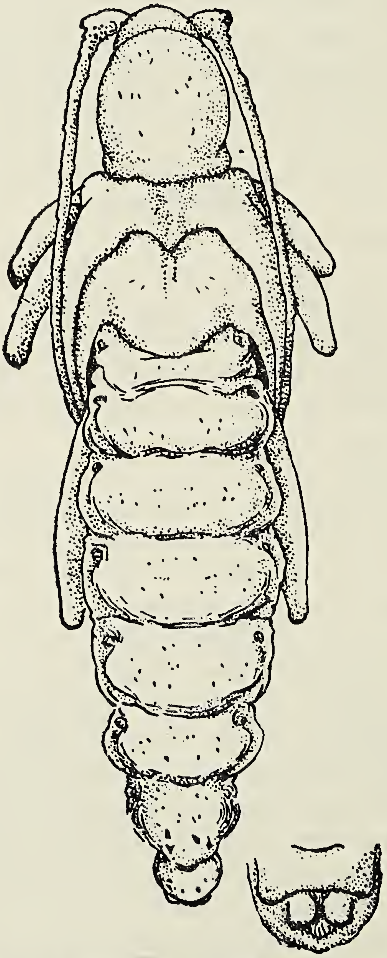
Pronotum slopes significantly toward front, broadly rounded at anterior margin, with pair of transverse rusty or yellowish-rust spots in an-
206 terior third; anterior margin with deep and distinctly notched spots, sides with longitudinally elongate or almost rounded yellow spot, and disk before scutellum and on sides with continuous cover of uniform rusty hairs. Pronotal shield white, laterally bound by deep straight grooves, convex posteriorly and matte silver here, with dense straight longitudinal striation toward front, hyaline stripe medially on anterior margin that extends forward up to rusty spots. Anterior margin of prosternum glabrous, matte. Disk of presternum convex, sometimes with indistinct median longitudinal groove, with uniform dense rusty hairs, and well- or poorly developed round paramedial yellow spots. Eusternum glabrous, leathery, divided by hairy field in middle toward front over half its length or completely up to posterior margin. Thoracic legs well developed, small, with acicular, faintly sclerotized claw.

Abdomen laterally with short, thin, not very dense, light-colored hairs. Dorsal locomotory ampullae sufficiently convex, divided by common deep median longitudinal groove, shagreen, matte silvery; sides with or without longitudinal fold. Ventral locomotory ampullae transversely elongate, with broad median depression, shagreen, and with or without barely perceptible transverse groove. Length of mature larvae 20 mm, width of head 2.8 to 3.0 mm.

Pupa (Figure 124): Body elongate. Head between antennae barely convex, with short channel-shaped median longitudinal groove, and pair
207 of short, barely perceptible bristles along sides. Antennae flexed to sides, looplike, bent forward in second half, with apices adjoining midtibiae.

Pronotum with almost parallel sides, broadens slightly laterally, slightly oblong, with narrow transverse groove posteriorly, and uniformly convex; disk with thin, barely protruding transverse streak, distinct or poorly expressed tubercle in middle part before posterior slope, and with thin randomly distributed bristles forming clusters arranged in crossband in anterior half, middle part, and along sides of posterior slope. Mesonotum convex, with angularly produced scutellum on posterior margin, saddle-shaped depression behind middle, and thin bristles before this depression forming crossband or transverse row. Metanotum moderately convex, with median longitudinal groove in anterior half, with thin bristles (three to four) along each side of groove, forming row obliquely directed toward anterior angle.

Abdomen elongate, broadens slightly at segment IV, and narrows gradually toward posterior end. Abdominal tergites uniformly convex, with distinct median longitudinal groove bearing short acute spinules along each side of groove forming clusters: one cluster behind middle and slightly lateral (five to seven spinules in each group); second in middle, shifted toward longitudinal groove (two spinules in each group); and two to four small spinules forming transverse row in anterior half; stray bristles set on sclerotized base. Abdominal tergite VII broadly rounded posteriorly; four to six large spinules on posterior margin form transverse row; pair of spinules ahead of row bent toward each other and constitute middle transverse row; four to six very small spinules in anterior half form anterior transverse row or this row absent. Tergite VIII



206 Figure 124. Pupa of *Paraclytus excultus* Bat., female.

broadly rounded posteriorly, with three to four erect spinules on posterior margin; disk with stray minute spinules. Valvifers of female almost conical, laterally bent at apex, and contiguous only at base. Body length 13 to 19 mm, width of abdomen 3.5 to 5.0 mm.

Material: Collected from Kunashir Island. Adult insects eight, larvae 78, pupae—36 males and females, larval exuviae with beetles from pupal cells two.

Distribution: Insular species; found in southern Kuril' (Iturup, Kunashir) and Japanese (Hokkaido, Honshu, Shikoku, Kyushu) Islands. Not found on the continent.

Biology: We studied this species in the forests of Kunashir Island. It inhabits broad-leaved and mixed forest plantations of varying density. Emergence of beetles begins in first half of June and continues to August. During this period beetles are seen on trees inhabited by them, rarely visit flowers. Eggs laid in bark and wood crevices on thick trunks of standing but desiccated trees, sometimes on dry branches of viable deciduous trees. Ovaries of one female, which had started oviposition, contained 72 mature eggs.

Larvae live in wood, make longitudinal galleries from bottom upward at a depth up to 5.0 cm, and like larvae of *Rhaphuma acutivittis* (Kr.) fill them compactly with fine frass. Pupal cell made at end of gallery in July–August (after the first, possibly, second hibernation) longitudinal to trunk. Larva pupates with head upward. Length of gallery up to 40 cm, width 7.0 to 8.0 mm. Length of pupal cell 18 to 38 mm, width 6.0 to 7.0 mm. Pupal cells located in upper layer of wood, sometimes right under bark.

208 Pupation commences end of July and continues to mid-August. For example, of 27 larvae observed under natural conditions, 22 pupated in first half of August, and only five in middle of this month. Young beetles emerge from pupae in second half of August and in September. They overwinter in pupal cells. With the onset of warm weather in spring, they make circular outlets (up to 4.0 mm in diameter) on surface of trunk at end of May and beginning of June, and emerge. Emergence of beetles from wood begins in third 10 days of May and terminates in second 10 days of June. We observed one beetle emerging from wood on June 18. Life cycle continues for two years, possibly three years. Weight of 35 specimens at different stages of development established: weight of larvae in populations before pupation ranges from 46 to 214 mg, of pupae from 42.5 to 195.0 mg, and young beetles before hibernation from 34 to 152 mg.

Paraclytus excultus Bat. develops on thick and thin trunks, but sometimes inhabits thin shoots. One pupa was found in shoot of an oak tree up to 3.0 cm in diameter, and the larval gallery extended along pith. On

Kunashir Island this species damages Sakhalin oak (*Phellodendron sachalinense*), maple (*Acer pictum*), Japanese alder (*Alnus japonica*), common ash (*Sorbus*), mulberry (*Morus*), and other deciduous trees. In 1974 we collected 118 insects (larvae, pupae, and adult insects): 38 from maple, 22 cork tree, 25 alder, seven elm, four each common ash and oak, six each mulberry and aralia, four birch, and one each from white ash and sour cherry. It has been recorded in Japan on *Alnus hirsuta*, *Fagus japonica*, *Quercus myrsinaefolia*, *Zelkova serrata*, and *Acer mono* (Kojima and Okabe, 1960).

11. Genus *Aglaophis* Thoms.

Thomson, 1857, *Archiv Entom.*, vol. 1, p. 315; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 530–531; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 305 (*Anaglyptus*, subg. *Aglaophis*); Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 87.

Adult: Readily recognized by structure of elytra, pronotum, and other characters. Antennae long, slender, barely short of reaching elytral apex. Pronotum oblong, with longitudinal elevation before posterior slope, and with dense punctation. Scutellum elongate, triangular. Elytra notched at apex, with acicular produced outer angle and rounded inner, protruding humeri at base, and elongate tubercle along sides of scutellum.

Larva: Body with parallel sides. Epistoma distinctly notched on anterior margin near clypeus, with very narrow brownish border. Parietals near antennae with transverse butt-shaped process on which hyaline, sometimes pigmented ocellus located in depression. Pronotum with short dense hairs with sclerotized base between scutellum and transverse yellowish spots. Thoracic legs fully developed, with sharp, thin poorly sclerotized claw. Locomotory ampullae of abdomen fairly convex, leathery, rugulose.

Pupa: Moderately elongate. Head with deep transverse constriction before eyes, transversely convex on frons between antennae, with triangular depression on vertex, and clypeus with longitudinal groove. Antennae arcuate in second half, with apiccs flexed ventrad. Pronotum oblong, with narrow deep transverse groove posteriorly, and acicular bristles forming clusters on sides and transverse median stripe. Abdominal
209 tergites with sharp spinules located on leathery base singly or in groups of two to four.

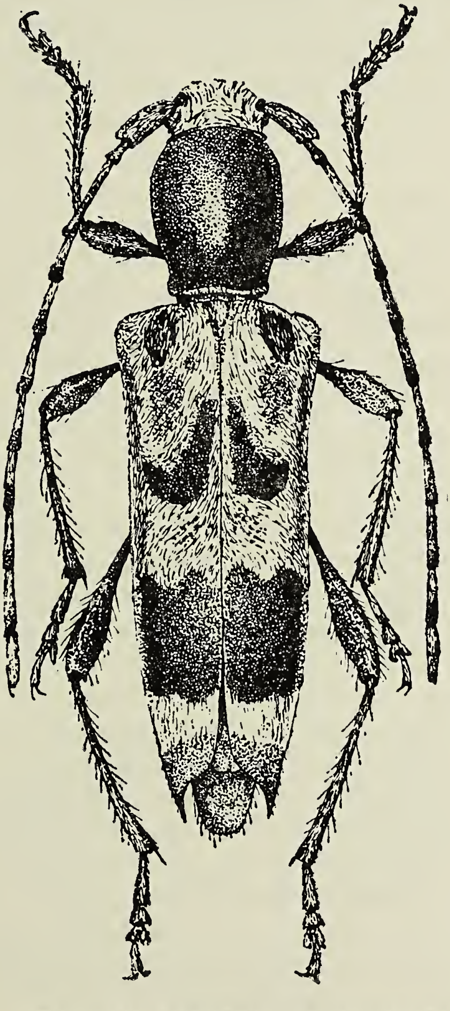
One species of the genus *Aglaophis* Thoms. is found in the fauna of northern Asia, and seven species known from southeast Asia.

Type species: *Aglaophis fasciatus* Thomson, 1857.

1. **Aglaophis colobotheoides** Bat.

Bates, 1884, *Linn. Soc. Lond. Zool.*, vol. 18, p. 235; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 531–533; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 305 (*Anaglyptus*); Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 87; Mamaev and Danilevskii, 1975, *Lichinki zhukov-drovosekov*, pp. 265–266.

Adult (Figure 125): Frons slightly convex or flat, with fine punctation, adherent white hairs directed backward (upward); tubercularly produced on sides between antennae; slopes abruptly on posterior margin. Vertex depressed and, like occiput, covered with white adherent hairs directed inward and forward. Antennae comparatively long, with



210 Figure 125. *Aglaophis colobotheoides* Bat.

apices reaching beyond 0.75 length of elytra, up to their posterior white band. First antennal segment elongate, thick, longer than 4th, and barely shorter than 3rd. Eyes slightly convex, broadly notched.

Pronotum barely oblong, laterally rounded, narrows more posteriorly and here with narrow constriction, narrowly bent anterior and posterior margins, with longitudinal produced tubercle before posterior slope of disk, with very dense punctation, short black adherent hairs, sides with stray, erect, thin brownish bristles. Scutellum elongate, triangular, with minute adherent hairs, sometimes depressed in middle.

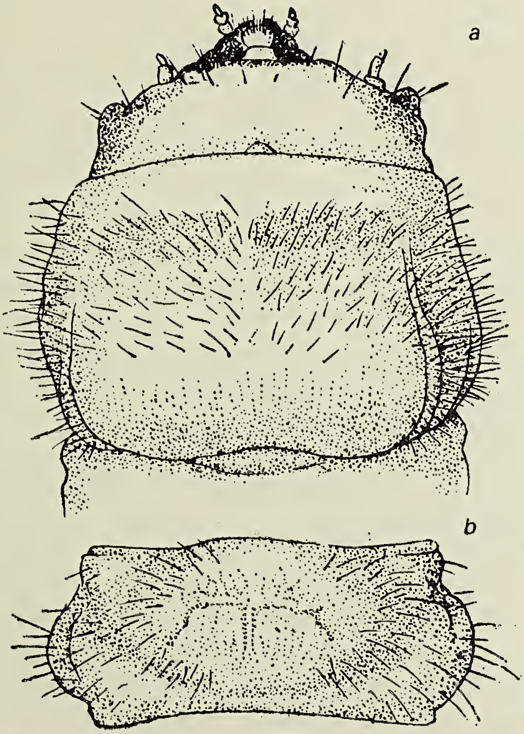
Elytra elongate, with almost parallel sides; scutellum laterally with strong spinelike tubercle at base (slightly bent in some insects); inner side of humeri with longitudinal depression that extends backward obliquely up to suture; elytra notched at apex, with rounded inner angle, spinelike (almost acicular) long produced outer angle, with dense punctation that is very fine in second half, and white, brownish, and black adherent hairs forming characteristic pattern that matches color of elytra: black and dark brown hairs on dark background, and white hairs on rusty background, form three narrow white crossbands toward front and one broad white crossband on posterior slope near apex. Elytra black between white bands (f. *typica*). In some specimens field between second and third band rusty, entirely covered with sparse white hairs (ab. *latefasciatus* Plav.). Legs short; femora clavate; hind tarsi less than 0.66 length of tibiae, with 1st segment slightly longer than two successive segments together. Body ventrally with adherent white and sparse semiadherent brownish hairs. Body and femoral clava black. Antennae, tibiae, tarsi, femoral base, abdominal apex (ventral view) and scutellum reddish-rusty; 1st antennal segment dark brown or black on upper side. Body length 10 to 14 mm.

Egg: Elongate, rounded on poles. Chorion smooth, without visible sculpture, lustrous. Length 1.7 mm, width 0.8 mm.

Larva (Figure 126): Head with parallel sides. Epistoma sometimes barely protrudes, with brownish tinge, distinctly notched on anterior margin near clypeus, with very narrow, linear, curved, dark brown, sharply protruding border, flattened posteriorly, indistinctly convex in anterior half, with barely perceptible or totally obliterated frontal sutures on sides, and well-defined or barely perceptible longitudinal suture in middle
210 of posterior half. Hypostoma narrows insignificantly toward front, slightly convex or flat, lustrous, with barely perceptible transverse streaks, abruptly truncate postero-inner margin of sclerites, and very narrow brownish border on anterior margin. Parietals near antennal base with transverse butt-shaped process on which one hyaline or pigmented ocellus located on each side in alveolar depression laterally bound by broad rusty border, with stray long hairs behind this border. Antennae com-

paratively long, slender, extend beyond anterior margin of cephalic capsule. Clypeus trapezoid, broadens markedly at base, whitish, sometimes with slightly brownish tinge. Labrum transverse, light colored, in some individuals slightly brownish at base, and with dense short light-colored bristles. Mandibles massive, broadly rounded at apex, on outer side convex, lustrous, black, at base reddish-rust; labial mentum transverse, with long bristles in posterior half forming transverse row.

Pronotum laterally slopes moderately toward head, with pair of transverse yellowish indistinct spots in anterior third, single lustrous spot on each side between shield and yellowish spots with short rusty hairs set on sclerotized chocolate-brown base forming large field divided by median longitudinal groove, with usually thin hairs laterally and in anterior third, without noticeable sclerotization posteriorly. Pronotal shield comparatively short, its length 0.25 width, convex, white, with longitudinal wrinkles, median longitudinal deep groove, and bound laterally by deep longitudinal folds reaching almost up to anterior margin of pronotum. Anterior margin of prosternum white, shagreen, without



211 Figure 126. Larva of *Aglaophis colobotheoides* Bat.
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

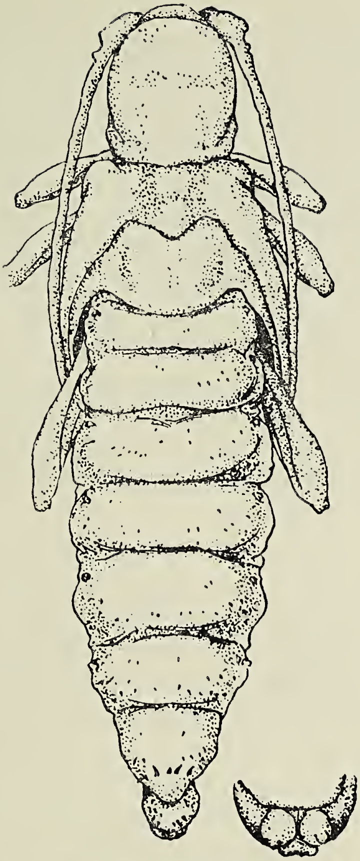
hairs. Presternum with dense long rusty hairs. Eusternum basally glabrous, leathery, and laterally not demarcated from presternum. Thoracic legs developed, with subulate slightly sclerotized straight claw.

Abdomen laterally with sparse light-colored or rusty hairs. Dorsal locomotory ampullae leathery, not shagreen, divided by common deep median longitudinal groove; sides with short longitudinal folds bent inward toward front where they join transverse groove; disk with alveolar depression with wrinkles originating from it. Ventral locomotory ampullae 211 divided medially by transverse groove that joins short lateral longitudinal folds, and sometimes seems to have alveolar depression; covered with minute longitudinal or radial divergent wrinkles. Body length of mature larvae 15 to 20 mm, with of head 2.0 to 2.2 mm.

Pupa (Figure 127): Head moderately bent with sharp narrow constriction before eyes, longitudinal groove on clypeus, transversely convex between antennae, with triangular depression and transverse streak here on vertex, and broadly rounded on occiput; sides of clypeus (along longitudinal groove) with two adherent bristles, and sides of frons with stray bristles. Antennae arcuate in second half, with apices flexed to elytra on ventral side.

Pronotum oblong, barely rounded laterally, with narrow and distinctly deep transverse groove near base uniformly broadly rounded at anterior margin, disk uniformly convex near slope, from where it gradually slopes torward front, with thin acicular bristles forming median transverse stripe and one small group before each angle of posterior slope; bristles on anterior slope stray, scattered, only in some insects form transverse, jumbled, undefined row near anterior margin. Mesonotum saddle, transversely depressed more in male than in female, and here laterally with minute bristles; posterior margin with produced raised shield. Metanotum convex, with median longitudinal channel-shaped 212 groove that is more distinct in anterior half; disk with thin transverse streaks, sides with longitudinal depression.

Abdomen with broadened segment IV, narrows insignificantly toward anterior and more toward posterior end. Abdominal tergites with narrow median longitudinal groove, in posterior half with small sharp spinules set (individually, in groups of two or three to four) on produced leathery base, which together form a curved jumbled transverse row; minute and barely perceptible spinules ahead of this row form one or two additional transverse rows; middle row with two and anterior with four spinules. Abdominal tergite VII with convex disk, posteriorly rounded; four to five large spinules on posterior margin form jumbled transverse row; six to seven spinules toward front (behind middle) constitute middle row; anterior half with three to four small spinules forming transverse anterior row. Tergite VIII transverse, broadly rounded posteriorly,



211 Figure 127. Pupa of *Aglaophis colobotheoides* Bat., female.

and with four to eight sharp spinules on posterior margin. Sternite VI angularly produced in middle of posterior margin, depressed on sides (male) or broadly flattened, rounded at posterior angles, and barely convex in middle of posterior margin (female). Valvifers of female hemispherical, highly contiguous, with ampullar lustrous apically rounded tubercle. Body length 12.0 to 15.5 mm, width 3.5 to 4.0 mm.

Material: Collected in Ussuri-Primor'e region. Adult insects 80, larvae 44, pupae 10, larval exuviae with beetles and pupae from pupal cells 14.

Distribution: Eastern regions of Asia: Ussuri-Primor'e region; northeast China, Korean Peninsula, and Japan including Hokkaido and Honshu.

Biology: Ecologically associated with broad-leaved forests. Inhabits floodland, valley, and mountain forests. Emergence of beetles recorded from mid-May to July. Maximum number of flying beetles recorded in

June. At this time they are found on trees inhabited by them, where mating and oviposition take place. Sometimes they visit flowers of various plants. Female lays eggs in crevices of bark or wood on trunks and thick shoots of pseudoacacia, apricot, and other trees. Egg development from laying to hatching of larvae continues for three to four weeks. For example, larvae began to appear at the end of January from eggs laid by beetles in the laboratory at the beginning of January. Air temperature during this period ranged from 14.6 to 20.0°C, average 17.5°C.

Larvae live in upper layer of wood, make longitudinal, often meandering galleries, and fill them compactly with frass. Length of gallery up to 15 cm or more, width at end up to 6.0 mm. Larva makes pupal cell longitudinal to trunk at end of gallery, cuts geniculate outlet to surface of trunk, then pupates with its head upward, i.e., toward exit. Length of pupal cell 23 to 45 mm, width 4.0 to 7.0 mm; length of outlet from pupal cell toward trunk surface up to 60 mm. Pupal cells located in wood at depth of 2.0 to 7.0 mm.

Pupation begins at end of third 10 days of July and is completed in August. Beetles emerge from pupae after two to three weeks. They overwinter in pupal cells, exiting only in spring of the next year. Emergence of beetles after hibernation from wood begins in second 10 days of May and ends beginning of June. Diameter of openings through which beetles exit from wood 4.0 mm. By this time gonads have matured. Ovaries of one female dissected two days after emergence from wood contained 22 mature eggs. Full cycle of development completed in two years, with first hibernation taking place during larval stage, and
213 second at the adult stage (Table 15). Weight of larvae before pupation (record of 19 individuals) ranged from 39.0 to 113.9 mg, of pupae 34 to 107 mg, and young beetles before hibernation from 28 to 86 mg. Beetles lose considerable weight during hibernation. For example, the total weight of three beetles soon after emergence from pupae (first hibernation) was 144.5 mg (100%), and after emergence from wood (after hibernation) 93.5 mg (64.8%), i.e., they lost up to 35.2% weight during this period.

In the Ussuri-Primor'e region *Aglaophis colobotheoides* Bat. inhabits

Table 15. Period of development of *Aglaophis colobotheoides* Bat.

Year of development	May	June	July	August	September	October
1st	A	AEL	AEL	EL	L	L
2nd	L	L	LP	LPA	PA	A
3rd	A	AEL	AEL	EL	L	L

trunks up to 25 cm in diameter and also thick shoots, predominantly of pseudoacacia (*Maakia amurensis*), apricot (*Armenica*), rarely maple, choke-cherry (*Padus maackii*), and white ash. We raised 62 beetles from larvae collected from lopped trees under natural conditions, including 34 from pseudoacacia, 23 from apricot, three from maple, one from Maack's choke-cherry, and one from white ash. During a survey of forests, larvae, pupae, and beetles (total 65) were extracted from wood: 27 from apricot, 17 pseudoacacia, five Maack's choke-cherry, two white ash, one maple, and 13 from other trees.

24. Tribe STENASPINI

Adult insects with elongate or broad body. Head short, frons broad, with dense punctation, genae comparatively long (*Purpuricenus*) or very short (*Asias*). Antennae thin toward apex, in many, especially in male, longer than body. Pronotum transverse, laterally rounded (*Asias*), or with produced, sometimes spinelike tubercle (*Purpuricenus*). Scutellum triangular, pointed at apex, rarely narrowly rounded. Elytra elongate (*Asias*) or comparatively broad (*Purpuricenus*), in some members broaden from humeri to apex (*Amarysius*). Abdominal sternite VI with coarse bristles in female that are broader or falcate at apex, and form triangular brush with golden-yellow tinge which broadens on posterior margin. Tergite VI divided into three lobes at posterior end, with dense thin hairs. Ovipositor short, distally divided into two elongate, usually bifurcate lobes, with one cercus at apex, located in cavity of segment VI; ovipositor barely extruded during oviposition. At rest, segment VI, together with ovipositor, invaginated into abdominal segment V.

Larva characterized by head very markedly retracted into prothorax. Epistoma with brownish, comparatively distinct median longitudinal suture. Frontal sutures not visible. Hypostoma with rusty or dark brown border on anterior margin, with very dense, thin, oblique (*Purpuricenus*) or straight longitudinal shaded pattern (*Asias*, *Amarysius*), which is indistinct only in some members (*Asias tuvensis* Tsher.). Thoracic legs fully developed. Pronotal shield glabrous, white, lustrous, with longitudinal streaks. Dorsal and ventral locomotory ampullae convex, leathery, often rugulose, developed on abdominal segments I to VII.

214 Pupa with elongate (*Asias*) or comparatively broad and stout (*Purpuricenus*) body. Head short, glabrous, without bristles. Antennae bent ventrad at apex, looplike (male) or semicircular (female). Pronotum rounded laterally (*Asias*, *Amarysius*) or with produced tubercle (*Purpuricenus*); disk convex, glabrous or with bristles forming clusters. Meso- and metanota with minute dotlike spinules or without them. Abdominal tergite I with very minute spinules. Tergites II to VI with minute or large,

but not very large sharp spinules forming transverse row or stripe. Tergite VII triangular, rarely rounded posteriorly; posterior margin with eight to ten large spinules directed forward; disk with very minute dot-like or large sharp spinules forming large scattered field, or small clusters, or two to three transverse rows. Tergite VIII short and glabrous, or with minute, sometimes sharp spinules forming large group on disk or jumbled transverse row on posterior margin. Tip of abdominal obtuse in female, significantly depressed dorsally and slightly from ventral side, with valvifers located in this depression.

The tribe Stenaspini (= Purpuricenini) comprises 20 genera in North America, eight in southeast Asia, two in Japan, three in northern Asia, of which one genus (*Purpuricenus*) is Holarctic in distribution. The species of this tribe are ecologically associated with deciduous trees and shrubs. Some of them [*Asias halodendri* (Pall.), *A. tuvensis* Tsher.] are adapted to xerophytic shrubs (*Caragana*) and undershrubs (*Nanophyton*), and are found together with these plants in steppe and semidesert areas. Females inhabit thin shoots of viable trees or shrubs. Oviposition is accompanied by a characteristic behavior of females. The female presses the tip of her abdomen to a shoot (abdominal tip equipped with brush of coarse bristles) and with rapid movements scrapes fine scales from bark; after a pause she oviposits, attaching eggs to surface of bark, then covers them with scales scraped earlier. Thus the egg resembles a small tubercle that matches the general background of bark. Having oviposited on one shoot, the female flies to another and repeats the same procedure.

KEY TO GENERA

Adult Insects

1 (2). Eyes located away from base of mandibles; length of genae more than width of eyes at constriction between upper and lower lobes. Pronotum laterally with produced, sometimes spine-like tubercle. 1. **Purpuricenus** Dejean.

2 (1). Eyes markedly shifted toward mandibular base; length of genae not more or even less than width of eyes at constriction between upper and lower lobes.

3 (4). Elytra with distinct deep, nonobliterated punctation. . . . . 2. **Asias** Sem.

4 (3). Elytra with indistinct, barely perceptible, as if obliterated, punctation. . . . . 3. **Amarysius** Fairm.

Larvae

1 (2). Hypostoma with dense, very thin but distinct pattern of streaks on anterior margin, directed obliquely toward outer angles of hypostoma. . . . . 1. **Purpuricenus** Dejean.

215 2 (1). Hypostoma with sparse or dense large, not very thin pattern of streaks on anterior margin; streaks longitudinal, not obliquely directed toward outer angles of hypostoma.

3 (4). Hair on anterior edge of rusty spots of pronotum long, with sclerotized ring at base, and form transverse row; rarely short and without ring (see *Asias tuvensis* Tsher.). . . . . 2. **Asias** Sem.

4 (3). Hairs on anterior edge of rusty spots of pronotum short, indistinguishable from other hairs, but always with sclerotized ring at base. . . . . 3. **Amarysius** Fairm.

Pupae

1 (2). Body broad, stout. Spinules on abdominal tergites II to VI large. Spinules on posterior margin of tergite VII biapical, falcate. . . . . 1. **Purpuricenus** Dejean.

2 (1). Body elongate, narrow. Spinules on abdominal tergites II to VI small, often dotlike, sometimes somewhat large, numerous, and form broad crossband. Spinules on posterior margin of tergite VII monoapical, not falcate.

3 (4). Pronotum with numerous bristles forming crossband and clusters on disk. . . . . 2. **Asias** Sem.

4 (3). Pronotum glabrous, without bristles, or with stray bristles that do not form crossband. . . . . 3. **Amarysius** Fairm.

1. Genus *Purpuricenus* Dejean

Dejean, 1821, *Catal. Coleoptéres*, p. 105; Germar, 1824; *Ins. Spec. Nov.*, p. 500; Latreille, 1829, *Regne Anim.*, vol. 25, p. 114; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 553–558; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 316; Linsley, 1962, *Cerambycidae of North America*, 20, 3, 103.

Adult: Head short, frons broad, with longitudinal groove between antennae. Genae long, length more than width near constriction in notch of eyes. Antennae longer than body (male) or barely shorter (female), thin gradually toward apex. Pronotum transverse. with distinct tubercle on each side that is sometimes scapularly produced, and with dense punctation. Scutellum elongate, triangular, pointed anteriorly. Elytra broad, parallel, sometimes broaden slightly toward apex, apically rounded or truncate, red with yellowish tinge sometimes, and with black pattern.

Larva: Differs from larvae of other genera in this tribe in very fine dense pattern of streaks on anterior margin of hypostoma, well-developed median epistomal suture, characteristic double pattern on pronotal shield (posterior half with fine and anterior half with larger and sparser parallel streaks).

Pupa: Characterized by presence of long biapical falcate spinules on posterior margin of tergite VII arranged in transverse row. Pronotal disk with sharp, somewhat large spinules forming large field. Posterior margin of tergite VIII with smaller sharp spinules.

The genus *Purpuricenus* Dejean is widely distributed in the Holarctic. Five species are known in North America.

Of the 13 species concentrated in the Palearctic, three are typical for northern Asia. One extends from Europe to the southern Urals, another from the southern provinces to Ussuri-Primor'e region, and the third inhabits forests of the Upper Ob'. This suggests that in the Tertiary
216 period the genus *Purpuricenus* was widely distributed in northern Asia, but is presently preserved here only in isolated areas.

Type species: *Cerambyx kaehleri* Linnaeus, 1758.

KEY TO SPECIES

Adult Insects

1 (4). Elytra truncate at apex or distinctly notched. Hind tarsi narrow; 1st segment not shorter than two successive segments together.

2 (3). Antennae shorter in female, longer than body in male. Pronotum laterally with distinct produced tubercle. Hind femora reach elytral apex (female) or extend beyond it (male). Europe, including southern Urals. . . . . 1. **P. kaehleri** (L.).

3 (2). Antennae of male and female shorter than body. Pronotum laterally with indistinct tubercle. Hind femora (male and female) do not reach elytral apex. Upper Ob'. . . . . 2. **P. tsherepanovae** Tsher.

4 (1). Elytra jointly rounded at apex. Hind tarsi broad; 1st segment much shorter than two successive segments together. . . . . 3. **P. petasifer** Fairm.

1. **Purpuricenus kaehleri** (L.)

Linnaeus, 1758, *Syst. Nat.*, 10th ed., p. 393 (*Cerambyx*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 560–565; Demelt, 1966, *Tierwelt Deutschlands*, vol. 52, p. 81.

Adult (Figure 128): Body stout, frons transverse, with coarse dense punctation, with bent anterior margin and triangular smooth platform here, with median longitudinal groove between antennae, and with produced margin near antennae. Vertex with large, occiput smaller punctation. Eyes deeply notched, with small facets. Space between upper lobes of eyes less than space between antennae. Genae comparatively long, length more than width of constriction of eyes. Antennae of male longer, of female shorter than body or barely reach beyond elytral apex. First antennal segment thick, with large longitudinally elongate punctation, and shorter than 4th segment; 11th segment with distinct constriction.

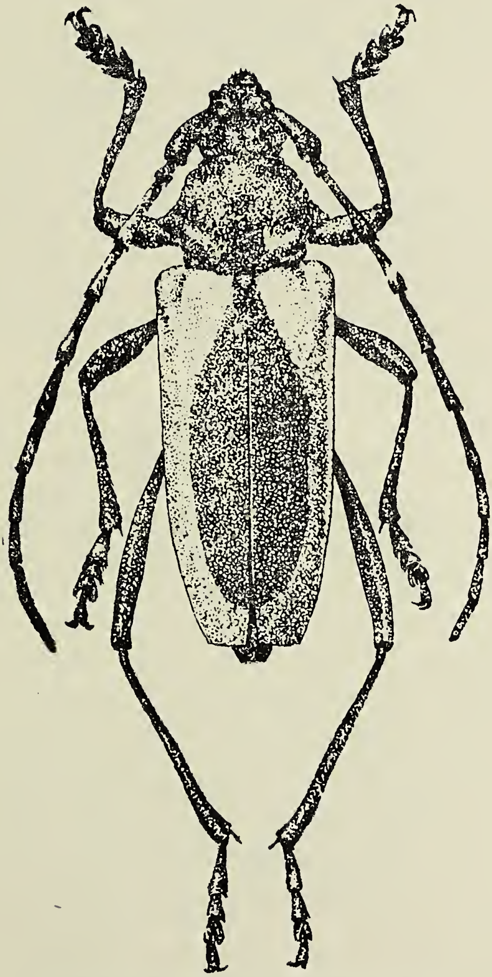


Figure 128. *Purpuricenus kaehleri* (L.).

Pronotum transverse, with narrow constriction near base, laterally with conical, sometimes spinelike produced tubercle and here with sparse erect brownish hairs; narrows equally at apex and toward base; disk convex and glabrous, with large deep and dense punctation (spaces between punctures very narrow), sometimes with shallow depression along sides of median line, with small smooth cornuate stripe (spot), or without it. Scutellum triangular, elongate, flat, markedly produced forward, and with black adherent hairs.

Elytra comparatively broad, parallel, narrowly rounded in posterior quarter, apically obtuse or truncate, with straight and slightly rounded humeri, disk moderately convex, with large, very deep and dense punctation (spaces between punctures much smaller than punctures). Very minute stray hairs do not form continuous coat and hence elytra appear glabrous. Legs comparatively long, femora gradually and indistinctly thicken distally. Hind femora extend beyond elytral apex or almost reach
217 it. Hind tarsi short and broad; 1st segment notably longer than two successive segments together. Body ventrally with sparse semiadherent dark brown hairs. Metasternum with dense punctation, abdomen with smaller sparse punctation. Body, antennae, legs, and scutellum black. Pronotum entirely black, or black with red spots on sides, or entirely red. Elytra red, with large oval black spot along suture (f. *typica*). This pattern changes from widening of red color to uniformly red (ab. *ruber* Geoffr.) and replacement by uniformly black tone (ab. *carbonarius* Reitt.). Body length 10.0 to 20.5 mm.

Egg: White with yellowish tinge, oval, uniformly broadly rounded at poles. Chorion matte, translucent, with alveolate sculpture. Alveoli deep, spaces between them barely smaller than alveoli. Length 1.8 mm, width 0.9 mm.

Larva (Figure 129): Differs from larvae of other species of the tribe Stenaspini in dense, very thin pattern of streaks on anterior margin of hypostoma. Head barely narrows toward front, distinctly alveolate on anterior margin near clypeus, were rusty brown border and here sometimes with transverse wrinkles, with median longitudinal dark brown suture, and laterally fused with parietals. Hypostoma broadens slightly toward front, with sharp anterolateral angles, rusty border on anterior margin, and dense, very thin pattern of streaks directed slightly oblique to outer angles. Gular plate flat, with barely perceptible border at apex. Parietals with broad and distinct or diffuse rusty border on anterior margin that covers ocellar-antennal area as well, anterior half with sparse short, barely perceptible hairs, sides with one hyaline ocellus each shifted close to antennal base. Clypeus small, trapezoid, with brownish tinge, and barely protrudes from under anterior margin of epistoma. Labrum convex, narrows ovally toward front, narrowly rounded apically, and with thin dense rusty bristles. Labial mentum transverse, with narrow brownish border on anterior margin, sides with rusty bristles behind middle. Mandibles without transverse grooves on outer side near base, distinctly flattened, black in anterior half, light red at base and here sometimes with short red median stripe extending forward.

218 Pronotum transverse, smoothly rounded laterally, with transverse rusty, usually distinct stripe near anterior margin divided medially and laterally by narrow white light-colored clearances into four transversely elongate spots. Pronotal disk before scutellum and laterally with dense uniform rusty hairs. Pronotal shield lustrous, white, with longitudinal pattern (striation in posterior half very minute and dense, in anterior

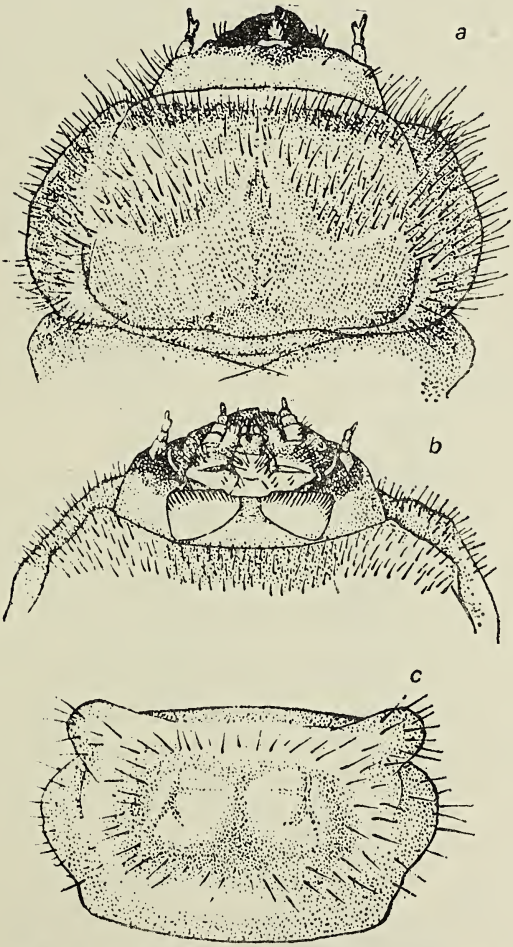


Figure 129. Larva of *Purpuricenus kaehleri* (L.).
a—head and pronotum; b—head (ventral view);
c—abdominal tergite with dorsal locomotory ampulla.

half larger and comparatively sparse), median longitudinal groove, and bound laterally by longitudinal curved deep folds. Anterior margin with two deep notches, and markedly produced forward medially and at anterior angles. Presternum convex, lustrous, disk with short uniform hairs, sides with longer rusty hairs, and anterior margin with two rusty spots. Eusternum posteriorly glabrous, lustrous, leathery, divided toward front by sparse hairy clearance. Thoracic legs developed, with rusty tinge, with short bristles on inner side forming transverse row at apex of each segment; claws thin, slightly sclerotized.

Abdomen laterally with rusty and not very dense hairs, dorsally and ventrally (toward back and front of locomotory ampullae) with stray
219 hairs. Dorsal locomotory ampullae convex, leathery, rugulose, divided by common median longitudinal groove, in anterior half by transverse groove that joins lateral short longitudinal folds that diverge backward. One short groove originates from inner side of these folds in posterior half of each ampulla, which is obliquely directed backward. Ventral locomotory ampullae transversely elongate, leathery, rugulose, sometimes appear to have longitudinal pattern, with median longitudinal depression, and divided by single transverse groove that joins short lateral folds. Abdomen with thin sparse light rusty hairs at tip. Length of mature larvae 25 to 27 mm, width of head up to 3.5 mm.

Pupa (Figure 130): Body broad. Head narrows from antennal base toward front, with median longitudinal depression between antennae, vertex flat or slightly depressed, occiput rounded, lustrous, glabrous, without bristles. Antennae comparatively thick, in second half, closer to apex, falcate (female) or looplike (male).

Pronotum transverse, laterally with markedly produced sharp conical tubercle, narrows more anteriorly, less posteriorly, disk convex, posterior third with broad transverse depression, narrow transverse groove posteriorly, with angles protruding slightly backward, and with short rusty bristles forming transverse stripe before middle and one sparse group each near anterior margin and posterior angles. Mesonotum convex, with broad depression near elytral base, laterally in posterior half with sharp rusty bristles (forming crossband or wide sparse cluster), and with sharp triangular elongate shield on back side. Metanotum broad, slightly convex, with deep median longitudinal groove, posterior margin angularly slightly produced medially, and with very minute, barely perceptible, scattered rusty bristles.

Abdomen broad, narrows slightly toward tip. Abdominal tergites with narrow shallow median longitudinal groove. Tergite I with minute dotlike spinules in posterior half, in anterior half with lateral transverse notch that is sometimes alveolar. Tergites II to VI with rounded or angular depression along sides of longitudinal groove, which is surrounded on all sides by sclerotized aristate spinules; spinules always smaller before depression, larger on back side, and form transverse row medially on posterior margin. Tergite VII transverse, almost semicircular, narrow from anterior to posterior end, broadly rounded on back side, moderately convex, with raised posterior margin and here with large biapical falcate spinules—one apex long, sharp, and bent forward and inward, the other apex in form of small sharp aristate spinule on back side; disk with numerous sharp spinules directed backward. Tergite VIII short, broadly rounded posteriorly, with minute numerous (female) or few (male) spinules. Valvifers of female transversely oval, flattened, with papillary produced tubercle at apex. Body length 12 to 19 mm, width of abdomen 5.0 to 7.0 mm.

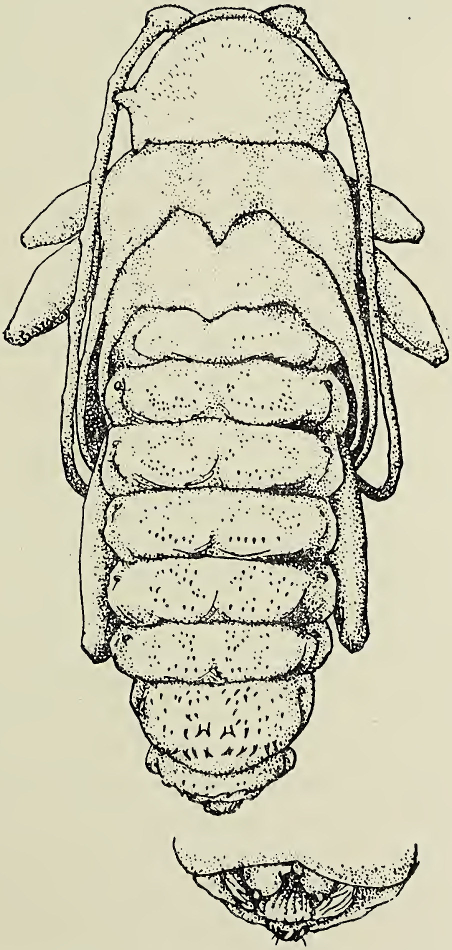


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Figure 130. Pupa of *Purpuricenus kaehleri* (L.), female.

Material: Collected in the southern Urals. Adult insects eight, larvae 19, pupae—one male and two females, larval and pupal exuviae from pupal cells with beetles four.

Distribution: Europe, from the Atlantic to the southern Urals. North almost up to 56 to 57° latitude, south up to the Mediterranean Sea. Common in broad-leaved forests in the southern Urals.

Biology: The biology of this species was studied in broad-leaved forests of the southern Urals. *Purpuricenus kaehleri* (L.) is ecologically associated predominantly with oak. Emergence of beetles commences in June and is completed in July. They are found on trees inhabited by 220 them, and not on flowers. Female oviposits on bark of thin shoots and covers eggs with minute scales scraped before hand from bark. Usually one egg is laid on each shoot. One female can lay up to 30 eggs in her lifetime. For example, three females held in a chamber laid 86 eggs in 20 days. On dissection their ovaries still contained two to three eggs. Fully developed larvae appear two to three weeks after oviposition. Under laboratory conditions at 22.1 ± 0.8°C egg development continued for 11 to 19 days, average 14.9 ± 0.9 days. We kept 83 eggs under observation. Two to three days after development mature larvae began to bore bark without leaving the egg membrane. They discarded frass through a ventilation opening made in the chorion, and only existed from the latter on the 13th to 17th day of their life, moving into wood.

Larvae live in wood, make minute longitudinal straight or meandering galleries (sometimes larger offshoots originate from main gallery), and fill them with fine frass. Galleries in thin shoots are made along pith, and in thicker shoots in upper layer of wood. Not more than one larva is found in each shoot. A long hollow chamber is made before pupation with an outlet (4.0 to 5.0 mm wide) at the end on surface of bark, and filled with large fibrous frass. Larva pupates in chamber with its head toward exit. Length of gallery made by larva in shoot ranges from 36 to 57 cm, width 8.0 to 10.0 mm. Length of pupal cell in which larva pupates ranges from 5.0 to 14.0 cm, width up to 10.0 mm. Length of exit from pupal cell filled with frass 8.0 to 14.0 mm.

Pupation occurs in May–June, and pupal stage continues for three weeks. Under laboratory conditions at 18.6 to 24.4°C (22.1 ± 0.7°C) a pupa developed in 20 days. Mature beetles start to emerge from pupae in first half of June. A mature beetle clears the passage of frass, makes an oval emergence exit (5.0 × 10.0 mm) on surface of shoot, and exits from wood through it. Emergence of beetles from wood completed in June to early July. Beetles emerge from wood with developed gonads. Ovaries of one female dissected soon after emergence from wood contained 16 mature eggs, of another 29.

Weight records of 14 individuals revealed: larvae before pupation

120 to 594 mg (321.6 ± 33.2), pupae 108 to 460 (262.6 ± 30.6 mg), and beetles before emergence from pupal cells 84 to 360 mg (178.3 ± 24.0). Weight of individual larvae before preparation for pupation may reach 660 mg. However, it decreases significantly during preparation for pupation. For example, a larva weighing 470 mg (100%) before preparation for pupation, immediately before pupation weighed 261 mg (56.7%). Beetles and larvae of early and middle instars found in wood in June. This indicates that the cycle of development continues for three years.

In the Urals we found *Purpuricenus kaehleri* (L.) on oak, elm, and choke-cherry, where it inhabited shoots 1.2 to 6.5 cm in diameter of drying as well as viable trees at a height of 4.0 to 10.0 m, i.e., this species occupies the crown of middle and upper tiers. Published reports (Plavil'shchikov, 1940; Demelt, 1966) indicate that the larvae of this species also lives on shoots of beech chestnut, willow, and other deciduous trees.

2. **Purpuricenus tsherepanovae** Tsher.

(Tsherepanov), Cherepanov, 1980, *Sistematika i ekologiya zhivotnykh* (*Nov. i maloizv. vidy fauny Sibiri*), pp. 89–91.

Adult (Figure 131): Close to *P. kaehleri* (L.). Differs well in more 221 elongate body, short antennae (male), and other characters. Body elongate. Head short. Frons broad, with dense punctation, smoothly bent at anterior margin, with median longitudinal groove between antennae, and with produced tubercle near antennal base. Genae long, finely punctate, their length distinctly greater than width of constriction between lobes of eyes. Vertex slightly flattened, with dense punctation. Eyes large, with small facets, and very deep and broad notch; space between upper lobes of eyes notably smaller than space between antennal sockets. Antennae slender, more (male) or less (female) thin toward apex, short, not reaching (female) or barely reaching elytral apex. First antennal segments thick, with large punctation, sparse adherent hairs, smooth and nonpunctate apex, almost not shorter than 4th segment. Fourth to 10th segments on outer side of apex with more (female) or less (male) spinelike produced margin. Eleventh segment long, slender, with notable constriction in posterior third (male) or less elongate and without discernible constriction (female).

Pronotum transverse, mediolaterally with distinct but not spinelike tubercle, narrows slightly more anteriorly, less posteriorly, disk uniformly convex, with narrow constriction, glabrous posteriorly, without hairs, with large and uniform punctation; species between punctures nonseptate, comparatively broad, barely narrower than dots [in *P. kaehleri* (L.) tubercles on sides of pronotum elongate, spinelike; spaces between punctures on pronotal disk very narrow, septate]. Scutellum triangular,

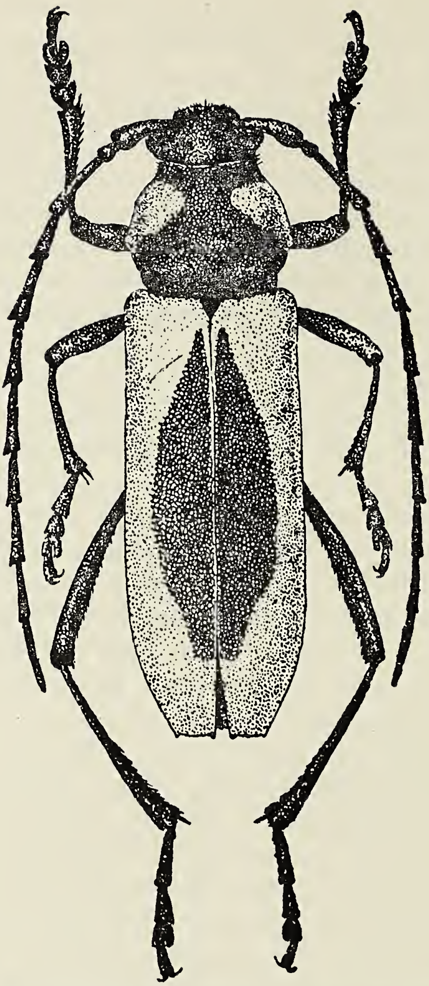


Figure 131. *Purpuricenus tsherepanovae* Tsher.

flat, pointed anteriorly, with coarse punctation, and with sparse black adherent hairs.

Elytra elongate, with parallel sides, length almost 2.5 times total width at humeri [in *P. kaehleri* (L.) elytral length 2.0 times width], notched at apex, with sharply produced inner angle, straight humeri, rounded humeral tubercle, without perceptible humeral depression, disk convex, with large dense deep punctation (spaces between punctures much smaller than punctures themselves) and with stray semiadherent black hairs in posterior half closer to apex. Legs moderately elongate, hind femora slender, thicken slightly distally, and do not reach (female) or in any case do not extend beyond elytral apex (male).

Hind tarsi comparatively narrow, 1st segment slightly longer than two successive segments together. Body ventrally with sparse semiadherent brownish hairs. Metanotum with dense punctation, abdominal tergites with less dense punctation. Body, antennae, legs, and scutellum
222 black. Pronotum black, sides of anterior half with transverse red spot angularly elongate on disk toward median line. Elytra red or ocherous-red, suture with ellipsoid longitudinally elongate black spot that does not reach forward up to scutellum, and terminates on back side near posterior slope. Anterior edge of this spot divided along suture by a narrow reddish stripe. Body length 14 to 15 mm.

Material: Collected in Upper Ob' region, in Novosibirsk-Baranaul area. Rare species. Larvae and pupae not known; two adult insects caught in July.

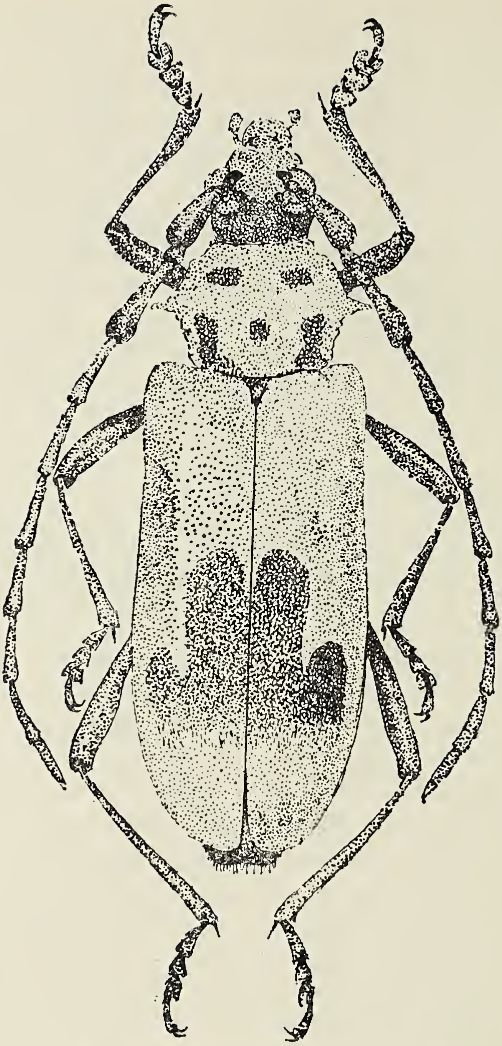
3. **Purpuricenus petasifer** Fairm.

Fairmaire, 1888, *Revue d'Entom.*, vol. 7, p. 140; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 584–586; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, pp. 318–319; Kojima and Okabe, 1960, *Food Plants of Jap. Cerambycidae*, p. 147.

Adult (Figure 132): Differs well from other species in color of pronotum and elytra and presence of four characteristic spots on them. Head short, narrower than pronotum. Frons with deep median longitudinal groove, covered with coarse uneven punctation and dense erect hairs, with deeply notched antennal socket, spinelike upturned margin, uninterrupted transversely ribbed carina toward front near base of clypeus, with depression along each side of carina in which dense large aristate punctation occurs. Eyes broadly and deeply notched, minutely faceted. Antennae of male long, 8th segment reaches beyond elytral apex; antennae of female short, barely longer than body. Antenal segments, commencing with 3rd or 4th, with sharp bladelike outer margin and here with produced apex.

Pronotum transverse, with narrow transverse constriction posteriorly, broadens medially, with sharply produced conical tubercle laterally, disk convex, with deep large punctation that fuses here and there (space between punctures narrow, septate), with long erect hairs laterally and short hairs on disk. Scutellum produced, oblong-triangular, pointed anteriorly, and with dense velvet-black hairs.

223 Elytra convex with parallel sides, jointly broadly rounded at apex, with protruding humeral tubercle and short longitudinal depression at its base on inner side, small depression on suture behind scutellum, with large very dense rugulose punctation at base and fine punctation in posterior half. Femora thicken slightly toward apex; hind tarsi much shorter than tibiae, their 1st segment not longer than two successive segments



222 Figure 132. *Purpuricenus petasifer* Fairm.

together. Body ventrally with long dense hairs. Head, meso- and metanota, abdomen and edge of posterior margin of prosternum, legs, and antennae black. Pronotum red, with five black spots—two before middle and three in posterior half near posterior margin. Elytra red, with black spots: one rounded or angular located at base, second extends along suture in posterior half and posteriorly bent, falcate, toward one side. Posterior spot usually covered with dense velvet-black hairy coat (f. *typica*). Sometimes anterior black spot of elytra absent (ab. *rosti* Pic), or divided into two spots (ab. *basilipunctatus* Plav.). Sometimes pronotum black with three red spots, and black anterior spot of elytra markedly enlarged (ab. *hummeli* Pic).

Material: Southeast Ussuri-Primor'e region. Adult insects—two males, one female (collection of the Zoological Museum, Moscow State University). Rare species, not found by us.

Distribution: Ussuri-Primor'e region; Korean Peninsula, China, Japan.

Biology: Inhabits broad-leaved forests. Emergence of beetles in June and July. Larvae live on branches of *Malus pumila* and *Pyrus pyrifolia* (Kojima and Okabe, 1960).

2. Genus *Asias* Sem.

Semenov-Tjan-Shanski, 1914, *Rev. Russ. d'Entom.*, vol. 14, p. 18; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 585–587; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 320; Mamaev and Danilevskii, 1975, *Lichinki zhukov-drovosekov*, pp. 218–219.

Adult: Body elongate, with parallel sides. Genae very short, length not more or even less than width. Eyes located in region of depression. Antennae significantly longer (male) or equal (female), rarely shorter (*A. tuvensis* Tsher.) than body. Pronotum barely oblong, with dense large punctation, erect hairs, rounded laterally, without tubercle, sometimes broadens angularly. Scutellum triangular, anteriorly pointed.

Elytra elongate, parallel, with large deep punctation at base and fine dense punctation on back side, red, with blackened stripe along suture that broadens angular [*A. ephippium* (Stev. and Dalm.)] or black with red spot at base and narrow red border near lateral margin [*A. halodendri* (Pall.)].

Larva: Characterized by long elongate body. Epistoma with median longitudinal brownish suture in posterior half. Hypostoma with rusty border on anterior margin, longitudinal pattern of streaks [*A. ephippium* (Stev. and Dalm.), *A. halodendri* (Pall.)]. Pronotum with transverse rusty spots in anterior third; anterior edge of spots with very long thick [*A. ephippium* (Stev. and Dalm.)] or moderately long [*A. halodendri* (Pall.)] bristles forming uniform or jumbled transverse row, or pronotum without large long bristles, only with usual short hairs (*A. tuvensis* Tsher.).

Pupa: Characterized by presence of bristles forming dense [*A. halodendri* (Pall.), *A. tuvensis* Tsher.] or sparse distinct [*A. ephippium* (Stev. 224 and Dalm.)] transverse stripes before middle and broad transverse field on anterior margin. Abdominal tergite VIII with subulate and comparatively long (*A. tuvensis* Tsher.) or minute sharp [*A. ephippium* (Stev. and Dalm.)] or dotlike [*A. halodendri* (Pall.)] spinules.

Three species of this genus are found in northern Asia. Two inhabit the southern steppe and forest-steppe regions, and penetrate far north along steppe areas; one species has adapted to semidesert *Nanophyton* in the steppes of Tuva.

Type species: *Cerambyx halodendri* Pallas, 1776.

KEY TO SPECIES

Adult Insects

1 (4). Antennae of male much longer than body, of female distinctly reach beyond elytral apex. Third antennal segment 1.5 to 2.0 times longer than 1st.

2 (3). Elytra at base between scutellum and humeral tubercle with large and deep punctation, only posteriorly along suture and laterally with minute fused punctation; black, with red spot near humeral plate at base and with narrow red border on lateral margin, rarely anterior third and sides red. Urals to Ussuri-Primor'e region. . . . . 1. **A. halodendri** (Pall.).

3 (2). Elytra in anterior third covered with deep fine punctation that fuses posteriorly; anterior half red, with longitudinal black stripe on suture that broadens on back side and occupies greater part of posterior half. Europe, Urals, Siberia. . . . . 2. **A. ephippium** (Stev. and Dalm.).

4 (1). Antennae of male barely reach beyond elytral apex, of female do not reach this point. Third antennal segment not longer than 1st. Tuva. . . . . 3. **A. tuvensis** Tsher.

Larvae

1 (4). Pronotum with large long bristles on anterior margin forming transverse row; remaining part covered with short hairs.

2 (3). Bristles on anterior margin of pronotum comparatively thin, not more than 1.5 times longer than usual hairs, generally form jumbled transverse row. Hypostoma on anterior margin with large (broad) streaks, with four streaks on each sclerite. Found on lower shoots of pea-shrub and other deciduous trees and shrubs. . . . . 1. **A. halodendri** (Pall.).

3 (2). Bristles on anterior margin of pronotum very large, 2.0 times longer than usual hairs, and form distinct transverse row. Hypostoma on anterior margin with minute streaks, and six to eight streaks on each sclerite. Found on thin shoots of various deciduous trees and shrubs. . . . . 2. **A. ephippium** (Stev. and Dalm.).

4 (1). Pronotum without large and long bristles on anterior margin, covered with usual uniform and not very long hairs. Found on *Nanophyton*. . . . . 3. **A. tuvensis** Tsher.

Pupae

1 (4). Antennae of male long, bent ventrad, and loop toward front. Abdominal tergite VIII on posterior half of disk with minute dot-like spinules.

225 2 (3). Hind femora apically reach beyond abdominal tergite IV (female) or barely beyond V (male). Pronotum with dense bristles before middle and near anterior margin, with distance between bristles much less than their length. . . . . 1. **A. halodendri** (Pall.).

3 (2). Hind femora apically reach beyond abdominal tergite V (female) or VI (male). Pronotum with sparse bristles before middle and near anterior margin, with distance between bristles not less than their length. . . . . 2. **A. ephippium** (Stev. and Dalm.).

4 (1). Antennae of male short, with apices barely bent ventrad and forward. Abdominal tergite VIII in posterior half with sharp subulate erect spinules forming two jumbled transverse rows. . . . . 3. **A. tuvensis** Tsher.

1. **Asias halodendri** (Pall.)

Pallas, 1776, *Reis. Russ. Reich.*, vol. 2, p. 724 (*Cerambyx*); Plavil'shchikov, 1940, *Fauna SSSR*, vol. 2, pp. 593–596; Cherepanov and Cherepanova, 1973, *Nov. i maloizv. vidy fauny Sibiri*, 6th ed., pp. 63–64; Cherepanov and Cherepanova, 1975. *Zhuki-drovoseki ivovykh lesov Sibiri*, pp. 120–123.

Adult (Figure 133): Body elongate. Head suspended, frons and vertex covered with large weak punctation. Eyes broadly notched. Antennae long, slender; 10th segment in female and 8th segment in male reach beyond apex of elytra. Eleventh antennal segment acicular, pointed at apex.

Pronotum moderately convex, narrows almost uniformly anteriorly, slightly angularly produced on sides, and covered with large deep punctation; spaces between punctures in form of thin septa. Scutellum triangular, pointed or angularly rounded anteriorly, slightly depressed posteriorly.

Elytra parallel, elongate, moderately convex, at humeri rounded or with barely perceptible, entirely rounded at apex, at base with rough and remaining part fine shagreen punctation, and with semiadherent minute hairs. Legs long, comparatively slender. Head, pronotum, elytral base, and ventral surface of body covered with long erect tubercular hairs. Body and antennae black. Elytra black, with red spots at base along sides of scutellum, and with red stripe on sides extending from base almost up to apex (f. *typica*), sometimes red in anterior half, laterally, and also at base including humeri (ab. *heptapotamicus* Sem.). Male genitalia large,

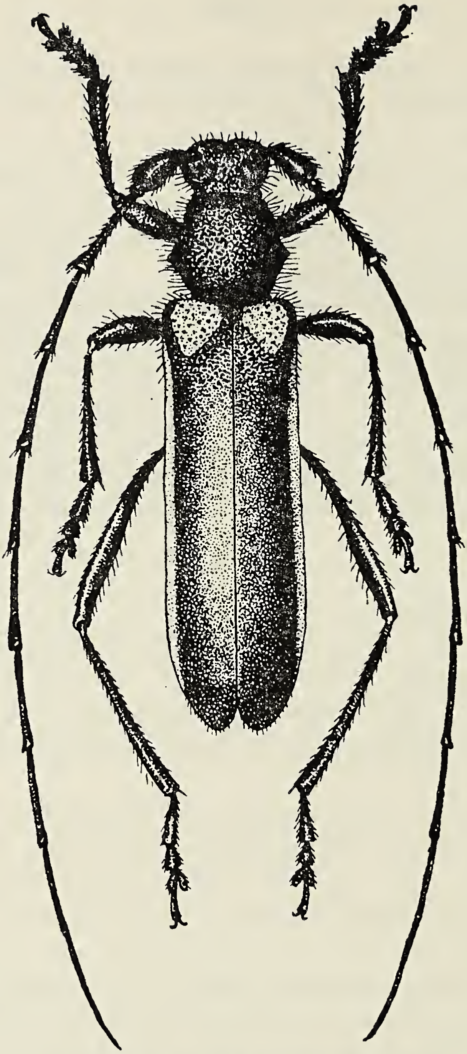


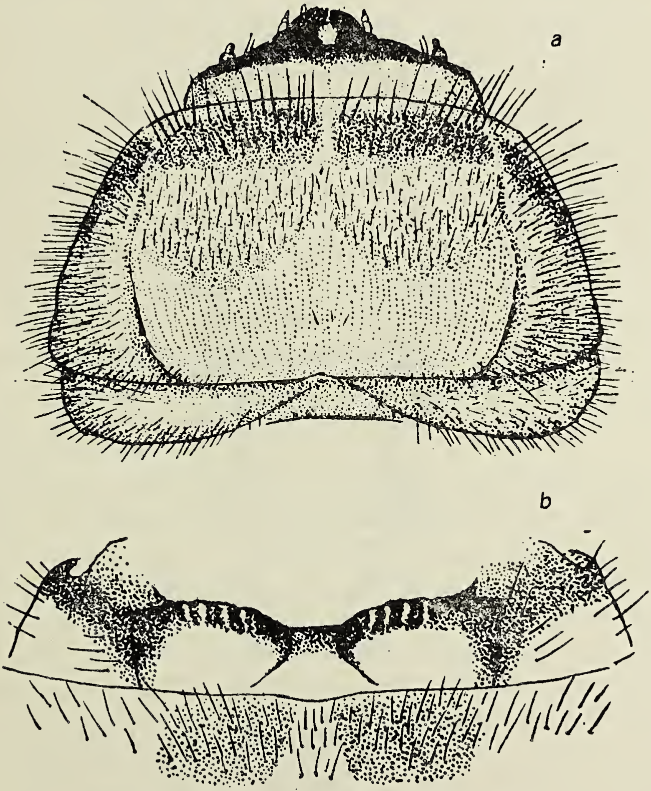
Figure 133. *Asias halodendri* (Pall.).

parameres narrow steeply toward apex, with similar obtuse inner and outer angles, and with uniform light-colored bristles. Ratio of total width of parameres at base to length on dorsal side 2.8 : 2.8. Body length 9.0 to 17.0 mm.

Egg: White, oval, thick, and obtusely rounded on poles. Chorion smooth, without alveolate sculpture. Length 1.4 mm, width 0.8 mm.

Larva (Figure 134): Differs well in pronotum and hypostoma. Body elongate. Head markedly retracted into prothorax. Clypeus small, narrow. Labrum almost not broader than clypeus, rounded at apex, and anterior margin with long bristles. Mandibles massive, rounded at end, and on inner side bucket shaped, hollowed out. Hypostoma with thick, dark rust, longitudinally flat, coarse border on anterior margin (four broad longitudinal streaks present on each sclerite). Prosternum broad, narrows smoothly anteriorly; presternum with moderately long uniform hairs; eusternum glabrous.

Pronotum slopes toward head, with long hairs ahead of shield, and anterior edge of rusty spots with large bristles bound at base and forming transverse uniform or jumbled row. Pronotal shield white, convex, 226 notched on each side of median line on anterior margin, with longitudinal, sometimes deep parallel streaks, laterally bound by longitudinal folds extending toward front up to posterior edge of rusty spots. Legs developed, long, with sharp claw. Dorsal locomotory ampullae convex, shagreen-leathery, divided by narrow median longitudinal groove, at anterior margin by transverse groove, and laterally by short grooves originating backward from transverse groove. Ventral locomotory ampullae

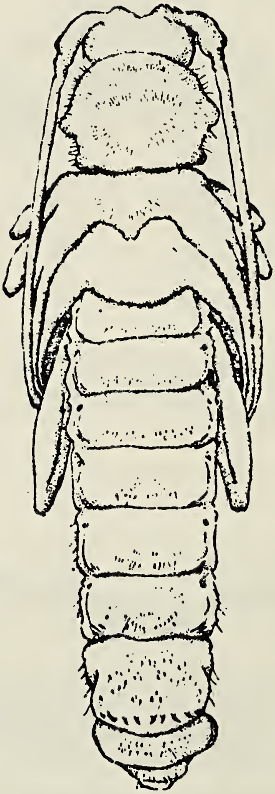


227 Figure 134. Larva of *Asias halodendri* (Pall.).
a—head and pronotum; b—hypostoma.

convex, pad shaped; disk with triradial groove-shaped depression. Body white. Pronotum with rusty spots in anterior half—two on disk and two along sides—creating impression in dorsal view of uniform rusty arcuate stripe divided medially and laterally by whitish field. Two rusty spots near anterior margin of prosternum. Length of last-instar larvae up to 23 mm, width of head 2.5 mm.

Pupa (Figure 135): Characterized by elongate abdomen, presence of dense (especially in female) bristles on pronotum, and other characters. Head glabrous, without bristles, with longitudinal narrow (male) or broad channel-shaped (female) groove between antennae, occiput rounded and lustrous. Antennae slender (male) or not so slender (female), in second half bent ventrad at level of abdominal segment II (female) or III to IV (female) [*sic*], and forward, with apices reaching metasternum or abdominal sternite I.

Pronotum slightly wider than long, laterally rounded and here with indistinct or distinct tubercle behind middle, with narrow transverse



227 Figure 135. Pupa of *Asias halodendri* (Pall.).

groove posteriorly, uniformly smooth toward front, with short median longitudinal depression on posterior slope; dense bristles before middle of disk form narrow crossband (distance between bristles here much less than their length), anteriorly covered with dense or notably sparse bristles forming broad transverse field, sides and anterior slope between crossband and transverse field with scattered solitary bristles or without them. Mesonotum convex, posterior margin with triangular, produced shield, posterior half with narrow transverse groove and before it minute bristles forming crossband medially interrupted by narrow clearance. Metanotum broad, transversely convex, with faint median longitudinal
227 groove, laterally with sparse minute bristles, and posterior margin broadly, sometimes angularly rounded.

Abdomen elongate, with almost parallel sides. Abdominal tergites convex, with common channel-shaped median groove, posterior margin with sharp aristate spinules forming transverse, sometimes jumbled, medially interrupted row, ahead of which three spinules occur along sides of longitudinal groove in anterior third, and dotlike spinules on sides. Tergite I with minute, dotlike spinules forming distinct jumbled transverse row. Tergite VII convex on disk, almost suspended posteriorly, with six to ten large sharp spinules on posterior margin bent forward and forming distinct transverse row, ahead of which three sharp spinules occur on each side of median line, and with uniform minute sharp spinules in anterior half on sides and on disk. Tergite VIII with indistinct dotlike aristate spinules. Hind femora apically reach beyond tergite IV (female) or up to posterior margin of abdominal tergite V. Valvifers of female narrow slightly toward apex, insignificantly separated, with small space between them, and with small hemispherical tubercle at apex. Body length 12 to 17 mm, width of abdomen 2.5 to 3.5 mm.

Material: Collected from Altai, Ob', Tuva, and Ussuri-Primor'e regions. Adult insects 46, including 17 raised under laboratory conditions, larvae 47, pupae—two males and one female, larval exuviae with beetles from pupal cells 14.

Distribution: Siberia, from the Urals to the Pacific coast; northern Mongolia, northeast China, Korean Peninsula. North up to Yakutia.
228 Abundant in southern forest-steppe and foothill regions of Siberia.

Biology: Inhabits steppe and forest-steppe area. Ecologically associated with deciduous trees and shrubs. Beetles emerge in July. Eggs laid on trunks. This species inhabits acacia, spurge olive (*Daphne mezereum*), willow, and oak. Larvae cut small hole under bark, bore into wood, and make longitudinal galleries there, first upward over length up to 2.0 cm and then downward. Total length of gallery in wood 13.2 to 20.5 cm. Sometimes gallery excavated in lateral part of trunk, with geniculate bends. Often, especially in thin shoots of up to 1.0 cm in diameter, they occupy pith.

Frass discarded through ventilation openings. Before pupation larva rises upward, fills gallery behind with fine frass, and makes pupal cell approximately mid-length of gallery. Length of pupal cell up to 4.0 cm, width up to 5.0 mm.

Pupae appear in June. Young beetles cut round or oval opening 4.0 to 6.0 mm in diameter on surface and exit from pupal cells. Sometimes larvae of early instars make spiral gallery in wood, at which place the shoot breaks and the larva develops in broken part of shoot. Sometimes two larvae occupy the same part of the shoot after boring longitudinal galleries on opposite sides of the trunk. Larvae vary in weight from 106 to 200 mg, pupae 82 to 160 mg, and young beetles before emergence from pupal cells 63 to 128 mg. They predominantly inhabit thin shoots of various trees and shrubs. We raised 17 beetles from larvae collected with wood sections from different areas: nine from pea-shrub, five oak, two white ash, and one lespedeza. An inspection of various trees and shrubs yielded a collection of 60 larvae, pupae, and beetles: 42 from pea-shrub, 13 oak, two white ash, one lespedeza, one spurge olive, and one from willow.

2. **Asias ephippium** (Stev. and Dalm.)

Steven and Dalman, 1817, *Syn. Ins.*, 1, 3, 157 (*Cerambyx*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 590–593; Kostin, 1973, *Zhuki-dendrofagi Kazakhstana*, p. 189 (*Asias halodendri ephippium* Stev. and Dalm.).

Adult (Figure 136): Very close to *A. halodendri* (Pall.). Differs in extensive red coloration of elytra. Head retracted into prothorax almost up to eyes, and with smooth median longitudinal groove between antennae. Genae very short, frons with minute and vertex very large punctation. Eyes with prominent notch, space between upper and lower lobes of eyes not less or even wider than length of gena near anterior margin. Antennae of male almost 1.5 times longer than body; 11th segment very long and slender, almost 2.0 times longer than 10th, with constriction in second half. Antennae of female barely reach beyond elytral apex; 11th segment short, not longer than 10th, comparatively thick, and apically pointed.

Pronotum not longer than wide, with produced tubercle on sides; disk with uniform deep punctation and long erect brownish hairs. Scutellum small, triangular, flat, and sharply produced anteriorly.

Elytra elongate, parallel, entirely rounded at apex, basally with more or less distinct longitudinal depression near humeral tubercle, with large and deep dots near base in anterior third and along sides, disk near suture with very minute, almost fused punctation, with short black hairs
229 that show up well against red background. Legs long, slender; hind femora reach posterior slope of elytra. Hind tarsi much shorter than

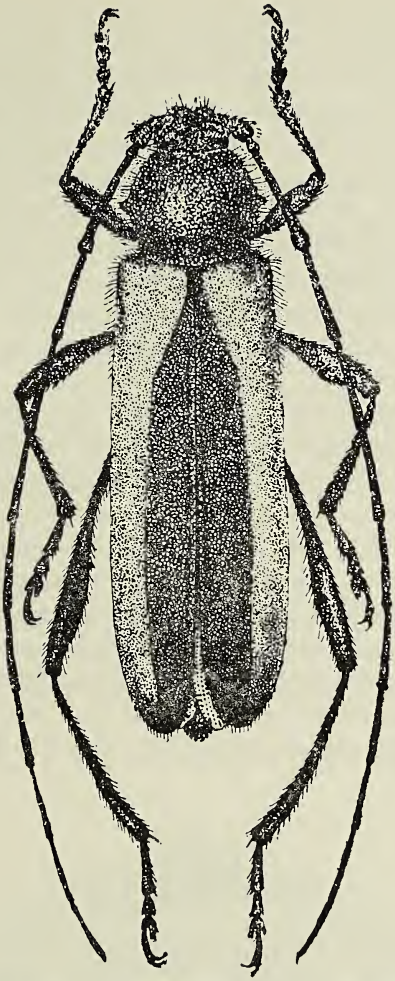


Figure 136. *Asias ephippium* (Stev. and Dalm.).

tibiae; 1st segment barely longer or not longer than two successive segments together. Body ventrally with long, thin, semiadherent, light-colored hairs. Metasternum with large odontoid punctation, abdominal sternites with smaller and barely dense punctation. Male genitalia characterized by parameres with narrowly rounded inner and more truncate outer angle at apex, and here with long bristles; inner angels with larger brownish bristles, and sides with reduced light-colored bristles. Ratio of total width of parameres at base to length along dorsal side 2 : 2.4. Body length 11 to 14 mm.

Egg: Oval, white with yellowish tinge, and broadly rounded on poles. Chorion smooth, lustrous, without perceptible sculpture, and translucent. Length 1.2 mm, width 0.8 mm.

Larva (Figure 137): Distinguished from its closest species [*A. halodendri* (Pall.)] by minute longitudinal streaks of hypostoma, and presence of longer bristles on anterior margin of pronotum forming transverse row. Epistoma with small notch on anterior margin near clypeus and distinct longitudinal suture in posterior half. Hypostoma with narrow brownish-rust border on anterior margin, very dense faint longitudinal streaks (up to six to eight streaks on each sclerite) that are more distinct medially, and obliterated at outer and inner margins. Gular plate between sclerites slightly oblong, narrow, and with dull rusty tinge. Parietals with very sharp rusty border on anterior margin, which covers ocellar-antennal area from behind. Ocellus convex, hyaline, and contiguous to antennal base.

Pronotum broadly rounded in posterior half, narrower toward front, with sharply protruding rusty transverse stripe on anterior margin, which is divided into four transverse rectangular spots by white longitudinal clearances (two spots on disk and one on each side), with uniform light rust hairs before shield and on sides, 12 to 14 longer thick bristles on anterior margin of disk near frontal edge of rusty spots forming uniform transverse row (these bristles basally with sclerotized ring and 2.0 times longer than usual hairs). Pronotal shield white, with two notches in anterior margin, median longitudinal grooves bound laterally by deep 230 longitudinal grooves, with short bristles at base forming transverse row, and toward front with dense longitudinal streaks. Presternum laterally

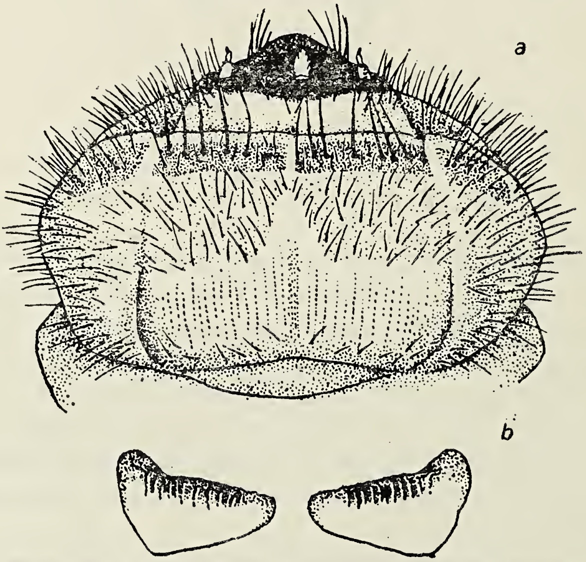


Figure 137. Larva of *Asias ephippium* (Stev. and Dalm.).
a—head and pronotum; b—hypostoma.

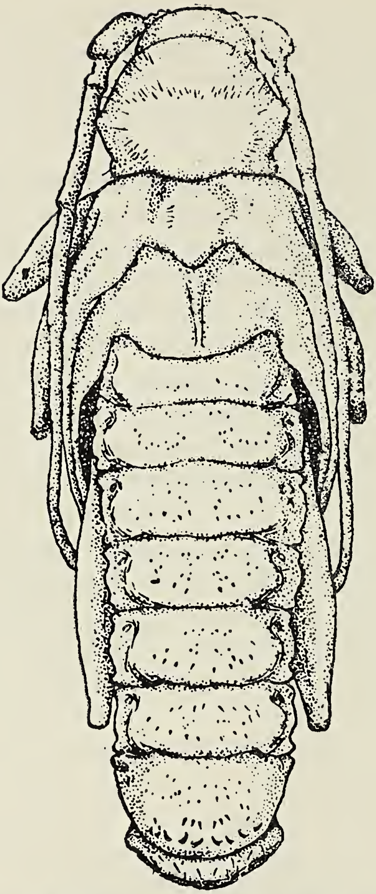
with long hairs, disk with short, comparatively dense hairs, and with two rusty spots on anterior margin. Eusternum glabrous, lustrous, with thin wrinkles, and barely perceptible hairy projection on anterior margin. Thoracic legs developed, with small, thin, barely sclerotized claw, and with stray bristles on inner side.

Abdomen elongate, sides with long light-colored hairs. Dorsal locomotory ampullae convex, matte, divided by common median longitudinal groove, sides with oblique and backwardly divergent short longitudinal folds with grooves originating from them in radial pattern: one extends toward middle in anterior half, the other slants backward toward median line almost onto disk. Ventral locomotory ampullae matte, divided by broad channel-shaped median groove; sides with alveolate fold and transverse groove originating medially from it inward. Abdominal tergite VIII on disk and tergite IX in posterior half with long sparse light rust hairs. Body length of mature larvae up to 23 mm, width of head 2.7 mm.

Pupa (Figure 138): Differs from pupa of *Asias halodendri* (Pall.) in poorly developed hairy cover on pronotum. Head with channel-shaped median longitudinal groove between antennae, and without bristles. Antennae long, bent ventrad toward front, looplike, with apices adjoining head (male), or short and falcate, with apices adjoining hind legs (female).

Pronotum convex, angularly rounded laterally, without distinct tubercle, slopes abruptly posteriorly and smoothly anteriorly, disk with very small hairs forming slightly protruding and not very dense (sparse) crossband medially, and sparse transverse field near anterior margin. Meso-
231 notum convex, with faint transverse streaks, smooth or sharply produced shield at posterior margin, with two to three indistinct bristles on sides. Metanotum rather convex, with narrow median longitudinal groove, barely rounded or straightly truncate posterior margin [in *A. halodendri* (Pall.) distinctly broadly rounded], with very small stray, barely visible bristles on sides.

Abdomen elongate, narrows indistinctly toward posterior end. Abdominal tergites with narrow median longitudinal groove. Tergite I with minute dotlike spinules that are difficult to distinguish. Tergites II to VI with somewhat large and short spinules on posterior margin forming transverse row, and sometimes smoothly directed backward, with three to four spinules ahead of row on each side of longitudinal groove forming cluster, and with minute dotlike spinules along sides and in anterior half forming transverse field. Tergites VII broadly rounded posteriorly, with 10, sometimes seven to nine spinules on posterior margin forming irregular or uniform transverse row, disk with sharp and small spinules directed backward forming narrow crossband or crossbands behind



230 Figure 138. Pupa of *Asias ephippium* (Stev. and Dalm.).

middle transverse row, and group in anterior half forming triangle. Tergite VIII short, narrows from anterior to posterior end, rounded posteriorly, disk with numerous minute sharp spinules. Hind femora long, reach middle of tergite VI or extend beyond it. Valvifers of female small, narrow toward apex, almost conical.

Material: Collected from the southern Urals and Tuva. Adult insects nine, larvae 14, pupae—two males and one female, larval exuviae with beetles and pupae from pupal cells four.

Distribution: Southern regions of the European territory of the Soviet Union, the southern Urals, Siberia; northern Mongolia. Sporadic everywhere.

Taxonomic remarks: Based on development and ecological characteristics, this species is close to *A. halodendri* (Pall.). However, it differs in the adult stage in coloration of elytra and structure of male genitalia, in the larval stage in minute pattern of streaks on hypostoma, and in the pupal stage in sparse bristles on pronotum and long hind femora. Apices of hind femora of *A. ephippium* (Stev. and Dalm.) reach middle of abdominal tergite VI (female) or even up to VII (male), while in *A. halodendri* (Pall.) they extend only beyond abdominal tergite IV (female) or slightly beyond V. Hence we are presently not combining *A. ephippium* (Stev. and Dalm.) with the previous species.

Biology: Inhabits deciduous plantations, predominantly in the forest-steppe zone, and penetrates steppes overgrown with shrubs. Ecologically associated with deciduous trees and shrubs. Beetles emerge in June and July, and found on flowers of Leguminosae (*Caragana*), Elaeagnaceae (*Elaeagnus*), Rosaceae (*Rosa*), and other plants. They inhabit thin shoots 1.7 to 3.5 cm in diameter.

Larvae live under bark, make longitudinal meandering or almost straight galleries in shoot, deeply impressed in wood, and fill them with fine frass. Galleries sometimes narrow, sometimes broaden, and acquire platformlike shape. Sometimes they continue in one direction, then turn or loop in opposite direction. Mature larvae move deeper into wood so that a layer about 1.0 to 2.0 mm of undamaged wood remains between gallery and bark. Sometimes gallery adjoins bark here and there, and when latter is removed, surface of wood appears perforated at these places. Mature larvae make galleries along pith of thin shoots. Galleries in wood are filled with fine frass at some places and left vacant at
232 others. Pupal cell constructed at end of gallery in wood longitudinal to shoot and closed with plug of coarse frass at upper and lower ends. Length of plug in lower part up to 8.0 mm, in upper part up to 4.0 mm. Length of pupal cells 24 to 50 mm, width up to 6.0 mm. Length of gallery under bark 10.5 to 38.0 cm, width initially up to 2.0 to 4.0 mm, terminally 6.0 to 10.0 mm. Length of gallery in wood varies from 6.5 to 19.0 cm, width 5.0 to 7.0 mm. Larva pupates in pupal cell with head upward.

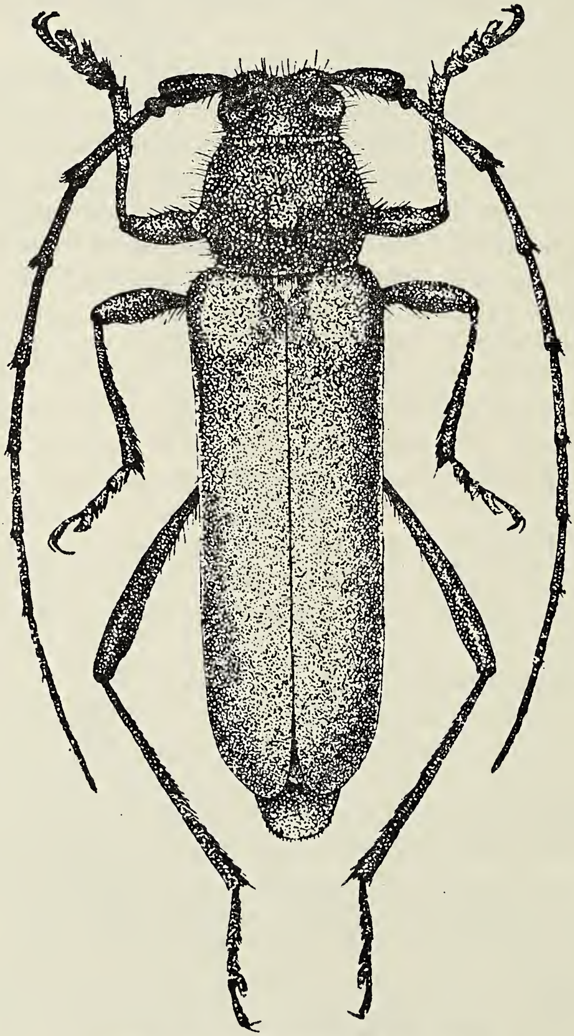
Under laboratory conditions at 18.2 to 25.0°C (21.2 ± 0.7°C) pupae developed in 16 to 18 days. Beetles emerged from them predominantly in June. Generation completed in two years. Larvae hibernate during early and late instars. Weight records of 17 individuals revealed: larvae before pupation 58 to 151 mg (98.5 ± 7.7) pupae 51 to 138 mg (84.2 ± 7.1), and beetles before emergence from wood 32 to 98 mg (62.1 ± 4.6). Weight of insects during development from prepupae to adult before emergence from pupal cell decreased, on the average, 37.0%.

Asias ephippium (Stev. and Dalm.) develops on shoots of various trees and shrubs. We raised adult insects from larvae collected in nature from pea-shrub (*Caragana pygmaea*), elm (*Ulmus laevis*), willow (*Salix* sp.), blackthorn (*Prunus spinosa*) and sweet briar (*Rosa* sp.). Shoots damaged by larvae wither.

3. **Asias tuvensis** Tsher.

Cherepanov and Cherepanova, 1978, *Taksonomiya i ekologiya chlenistonogikh Sibiri* (*Nov. i maloizv. vidy fauny Sibiri*), pp. 138–143.

Adult (Figure 139): Body moderately elongate. Head short, markedly retracted into prothorax, with fine deep punctation, and rusty hairs. Eyes convex, minutely faceted, black, deeply notched on inner side, upper lobes narrow, flat, and almost adjoin anterior margin of pronotum; if not contiguous, distance between them equal to 0.50 length of



233 Figure 139. *Asias tuvensis* Tsher., male.

gena. Antennae with 11 segments, reach beyond middle of elytra (female) or elytral apex (male). Third antennal segment significantly longer than 5th, in male equal to total length of 4th and 5th segments, in female slightly shorter.

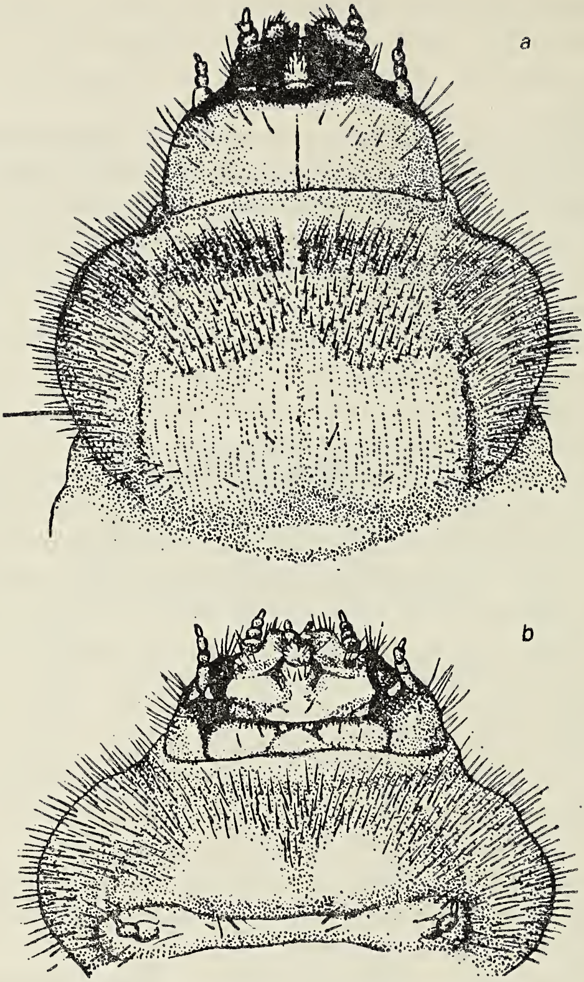
Pronotum not longer than wide, with sharply protruding lateral tubercle at base, convex on disk along sides and posteriorly, with indistinct median alveolate depression, with dense coarse punctation and sparse minute adherent hairs. Scutellum triangular, broadly depressed posteriorly, with dense, compactly adherent, light-colored hairs, their length not more than basal width.

Elytra with parallel sides, elongate, convex, with pair of indistinct longitudinal combs or without them, jointly rounded at apex, with minute adherent hairs and fine dense punctation, matte throughout surface, with large deep dots only near posterior end of scutellum, with lustrous spaces between punctures forming longitudinally elongate spots. Legs long, slender; apices of hind femora reach posterior elytral slope; Hind tarsi about 0.50 length of tibiae. First segment of hind tarsi shorter than total length of all successive segments. Abdominal tergite V with minute dense adherent hairs, posteriorly broadly rounded (male) or obtuse (female); sternite V posteriorly straightly truncate (male) or slightly notched (female). Body ventrally matte, with dense punctation, fine compactly adherent and long erect (in middle part) hairs. Body black. Elytra black, with narrow red border laterally, which extends from base to apex or up to two-thirds length of elytra, near humeral tubercle in region of large punctation with oval red spot. Body length 11 to 14 mm.

233 *Asias tuvensis* Tsher. is close to *A. mongolicus* Ganglb., but differs in minutely punctate matte elytra not only on disk but also on sides, anterior margin of pronotum markedly shifted toward eyes, longer 3rd antennal segment, and other characters.

Larva (Figure 140): Similar to larva of *Asias halodendri* (Pall.). Differs in absence of large bristles forming transverse row on anterior margin of pronotum. Body elongate. Head about 0.50 width of pronotum, with parallel sides, and markedly retracted into prothorax. Epistoma slightly convex, fused with parietals, and with lustrous chocolate-brown border on anterior margin. Frontal sutures smooth, not visible; median longitudinal suture looks like sharp chocolate-brown line. Hypostoma with more or less rounded anterolateral angles, with rusty border on anterior margin, and barely perceptible or not discernible minute longitudinal streaks. Clypeus short, lustrous, indistinct. Labrum small, oval, convex, with dense short bristles, and barely covers joint of mandibles on upper side. Mandibles massive, apically rounded, on inner side bucket shaped, hollow.

Pronotum convex, slopes markedly toward head, and with long thin



234 Figure 140. Larva of *Asias tuvensis* Tsher.
a—head and pronotum; b—head and prosternum.

rusty hairs on sides and before shield (in anterior half). Pronotal shield white, markedly convex, with deep lateral longitudinal fold, two notches on anterior margin, anterior angles produced forward and medially cuneiform, with more or less distinct median longitudinal groove, and short, barely perceptible stray bristles. Presternum with long dense hairs, eusternum with two round glabrous lustrous sclerites divided medially toward front partly or completely by hairy field. Thoracic legs poorly developed, short, with thin nonpigmented claws.

Abdomen elongate, laterally with short tender hairs, segments I to VII with oblique, bulging locomotory ampullae divided by deep median longitudinal groove. Body white, mandibles dark brown, legs rusty. Anterior margin of pronotum with rusty or rusty-yellow stripe divided 234 laterally and medially by narrow white clearances into four transverse rectangular spots. Body length of mature larvae up to 20 mm, width of head 1.8 mm, and width of prothorax 3.2 mm.

Pupa (Figure 141): Body elongate, with parallel sides. Head short, transversely convex on frons between antennal bases, with transverse depression between antennae and anteclypeus, uniformly rounded at occiput, glabrous, without bristles. Antennae flexed compactly to sides, falcate at apex, and here adjoin elytra. Pronotum not longer than wide, laterally with sharp pointed conical tubercle; disk uniformly convex, with barely perceptible transverse groove along anterior and posterior margin; minute bristles, barely visible under high magnification, form medial crossband. Meso- and metanota slightly convex, with stray minute bristles.

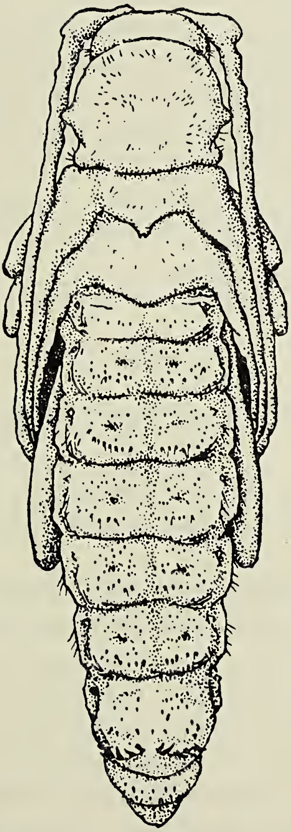


Figure 141. Pupa of *Asias tuvensis* Tsher.

Abdomen elongate, with narrow median longitudinal groove. Abdominal tergites with minute dotlike aristate spinules forming uniform transverse row interrupted medially by longitudinal groove. Tergite VII
235 with nine to 12 large aristate spinules on posterior margin, which are falcate, bent forward, and form transverse row interrupted medially by small clearance. Bristles always diverge from posterior edge of base of spinules. Body length 11 to 14 mm, width of abdomen 3.1 mm.

Material: Collected in Tuva (Ulug-Khemspaya basin, neat village Chaa-Khol'). Adult insects three, larvae seven, pupae three, larval exuviae from pupal cells with beetles two.

Biology: Inhabits semidesert steppes of Tuva basin. Ecologically associated with *Nanophyton erinaceum*. Beetles emerge in July. Female oviposits on thin shoots up to 3.0 mm in diameter on viable trees. After hatching larvae make galleries first under bark, then bore into wood and continue galleries there in longitudinal direction, from top to bottom, and penetrate roots. Galleries filled with fine frass. Larvae of last instar make pupal cell 3.0 to 5.0 cm long and 5.0 to 7.0 mm wide and pupate in it with head toward surface. This species inhabits shoots of *Nanophyton* up to 2.0 cm in diameter. Usually not more than one insect develops in a single shoot. Weight of one larva before pupation 93.5 mg, of pupa developed from it 87.5 mg (female); corresponding weights of another larva and pupa were 79.5 mg and 75.0 mg (male). Weight of other larvae 52.0 and 72.0 mg (male). Weight of one adult male 100 mg, female 120 mg. Maximum weight of larva recorded before preparation for pupation 219 mg. Generation completed in three years. Lives in semidesert steppes. Larvae damage branches of *Nanophyton*. Not found on other trees.

3. Genus *Amarysius* Fairm.

Fairmaire, 1888, *Rev. Russ. d'Entom.*, vol. 7, p. 140; Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 608; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 323.

Adult: Head short, with dense punctation, and deep median longitudinal groove between antennae. Genae short, their length near notch on anterior margin less than transverse constriction of eyes. Pronotum slightly transverse or length equal to width, with comparatively large dense punctation, laterally rounded or broadens angularly, sometimes with small produced tubercle. Elytra elongate, with parallel sides, or broadens slightly toward apex, with well-developed or indistinct longitudinal carinae, rounded at apex, edges eroded, with fine, barely distinguishable punctation, and with short black hairs.

Larva: Distinguishing feature—hypostoma with large or small longitudinal streaks on anterior margin. Frontal suture not visible, median longitudinal suture distinct in posterior half of epistoma. Pronotum transversely oval or narrows more toward front, with two transversely rectangular rusty spots near anterior margin of disk, sides with lustrous, sometimes entirely glabrous yellow spot. Hairs on yellow spot basally with sclerotized ring, hairs between shield and yellow spots with or without ring.

Pupa: Exhibits better distinguishing characters. Head glabrous, without bristles. Antennae flexed to sides, apically falcate or looped, turned toward front. Pronotum laterally rounded (*A. duplicatus* Tsher.) or angularly elongate, sometimes with distinct tubercle [*A. altajensis* (Laxm.)]. Abdominal tergite I glabrous, without spinules. Tergites II to VI with large (*A. duplicatus* Tsher.) or small [*A. altajensis* (Laxm.)] number of spinules. Tergite VII usually transverse, straightly truncate or rounded posteriorly, with larger spinules on posterior margin bent forward and forming trans- 236 verse row (up to six to ten spinules per row); disk with or without minute spinules. Tip of abdomen (dorsal and ventral view) deeply depressed in female and hence often appears truncate in dorsal view; in male pointed or even rounded and does not appear truncate in dorsal view.

This genus comprises four species, which are ecologically associated with deciduous trees and shrubs in northern Asia, from Altai to the Pacific coast.

Type species: *Anoplistes sanguinipennis* Blessig, 1872.

KEY TO SPECIES

Adult Insects

1 (6). Pronotum laterally rounded, without tubercles, and on disk with erect brownish hairs.

2 (5). Elytra with short semiadherent black and thin long erect brownish hairs, red, with broad black and longitudinal stripe along suture.

3 (4). Elytra 2.8 times longer than width at humeri. Abdominal sternite V in male rounded posteriorly. Altai to Pacific coast. . . . . 1. **A. altajensis** (Laxm.).

4 (3). Elytra 3.0 times longer than width at humeri. Abdominal sternite V in male notched posteriorly. Altai, western Sayans. . . . . 2. **A. duplicatus** Tsher.

5 (2). Elytra with only short semiadherent black hairs, without long erect hairs, entirely red, and without black spot along suture. From Altai to Pacific coast. . . . . . . 3. **A. sanguinipennis** (Bless.).

6 (1). Pronotum laterally with tubercles. Ussuri-Primor'e region. . . . . 4. **A. grallator** (Baeckm.).

Larvae

1 (4). Hypostoma with minute dense longitudinal streaks on anterior margin. Each sclerite with at least 10 longitudinal dark brownish carinae. Tip of abdomen with not very dense, even sparse hairs.

2 (3). Longitudinal streaks on anterior margin of hypostoma distinct, occupy almost entire anterior margin. Dark brownish longitudinal carinae (10 or more on each sclerite of hypostoma) prominent against light rusty background of grooves. Hairs on anterior margin of pronotum basally with sclerotized ring and form two jumbled transverse rows, which constitute narrow stripe in region of yellow spots. Found on hawthorn, choke-cherry, and other deciduous trees. . . . . 1. **A. altajensis** (Laxm.).

3 (2). Longitudinal streaks on anterior margin of hypostoma very small, blurred, poorly distinguishable, and occupy only lateral half of anterior margin of sclerites. Hairs on anterior margin of pronotum basally with sclerotized ring and form up to six jumbled transverse rows, which constitute broad transverse field in region of yellow spots. Found on spiraea. . . . . 2. **A. duplicatus** Tsher.

4 (1). Hypostoma with large longitudinal streaks on anterior margin. Each sclerite with not more than six to seven longitudinal dark brownish carinae directed laterally. Tip of abdomen with dense long hairs, appears densely hairy. Found on oak. . . . . 3. **A. sanguinipennis** (Bless.).

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Pupae

1 (4). Spinules on disk of abdominal tergite VII very minute, form one small paramedial group on each side of median line, or large and form common wide field.

2 (3). Pronotum laterally angularly produced, with protruding tubercle. Abdominal tergites II to VI with several spinules on posterior margin forming jumbled transverse row or narrow crossband (up to 12 spinules on each side of longitudinal groove). Spinules on disk of abdominal tergite VII minute, form two small clusters. . . . . 1. **A. altajensis** (Laxm.).

3 (2). Pronotum laterally rounded, without tubercles. Abdominal tergites II to VI with numerous spinules in posterior half forming broad crossband (more than 30 spinules on each side of longitudinal groove). Spinules on disk of tergite VII large and cover almost entire disk. . . . . 2. **A. duplicatus** Tsher.

4 (1). Spinules on disk of abdominal tergite VII sharp, highly visible, form two transverse rows: one behind middle comprises two spinules adjacent to each other, the other row before middle comprises four spinules. . . . . 3. **A. sanguinipennis** (Bless.).

1. **Amarysius altajensis** (Laxm.)

Laxmann, 1770, *Nev. Comment. Acad. Petrop.*, 14, 1, 597 (*Leptura*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 609–611; Gressit, 1951, *Longicorn Beetles of China*, vol. 2, pp. 323–324; Cherepanov and Cherepanova, 1975, *Zhuki-drovoseki ivovykh lesov Sibiri*, pp. 123–127 (= *ussuricus* Tsher. ssp.).

Adult (Figure 142): Characterized by comparatively broad and indistinctly convex red elytra, with common large oval black spot on disk, rounded posterior end of abdominal sternite V (male), and other characters. Head markedly convex between antennae, with spinelike produced tubercle toward upper side near antennal base, median longitudinal groove, very dense punctation, and long erect brownish hairs. Eyes with minute facets, broadly notched and constriction barely shorter than width of upper lobes. In male 9th antennal segment reaches beyond elytral apex, and 6th to 10th segments with longitudinal narrow uninterrupted carina on inner side, especially in insects from Ussuri-Primor'e region; 11th segment longer than 10th, pointed at apex, and with distinct constriction. In female antennae shorter than body, reach elytral apex or posterior slope, without longitudinal carina on inner side of 6th to 10th segments; 11th segment barely longer than 10th, and apex narrow, resembles projection.

Pronotum slightly transverse, laterally rounded or angularly produced, disk convex, with slightly raised relief, narrows slightly more anteriorly, less posteriorly, with narrow and indistinct longitudinal groove on anterior and posterior margin, with dense deep punctation (spaces between punctures narrow, septate), and with dense erect brownish aristate hairs. Scutellum broad, scapularly narrows posteriorly, and produced anteriorly, with fine punctation and brownish hairs.

Elytra elongate, 2.8 times longer than width at humeri, broaden slightly at base toward back side, entirely rounded at apex, with more truncate outer angle; with straight humeri, behind them slightly compressed laterally, matte, with longitudinal lustrous striae—one originating
238 from humeri, the other from inner side up to posterior slope; with obliterated punctation, short and semiadherent black hairs, but basally longer, erect and brownish hairs. Body ventrally with semiadherent and erect brownish hairs. Metasternum with moderately dense punctation on disk and very dense punctation on sides (here spaces between punctures much smaller than punctures themselves). Abdominal sternites

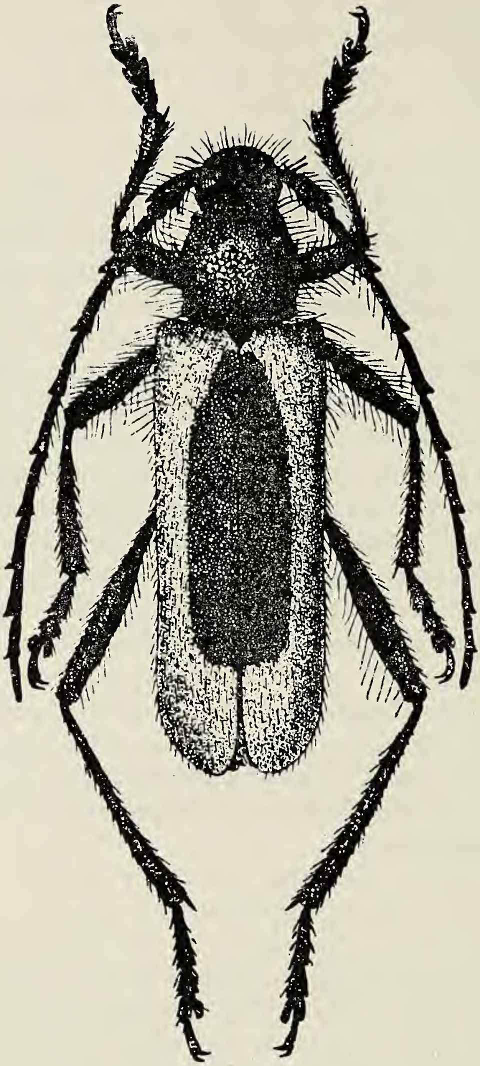


Figure 142. *Amarysius altajensis* (Laxm.).

with fine punctation, sternite V rounded posteriorly in male, transversely truncate in female, with dense semiadherent brownish hairs, on posterior margin with aristate hairs.

Edeagus of male elongate. Phallobase broadly notched basally on dorsal side, without projection along sides of notch; processes of phallobase arc encircle phallus laterally, markedly produced toward front on lower side, and contiguous at ends as if fused. Parameres uniformly rounded at apex but thicken slightly dorsally here and darker with long bristles;

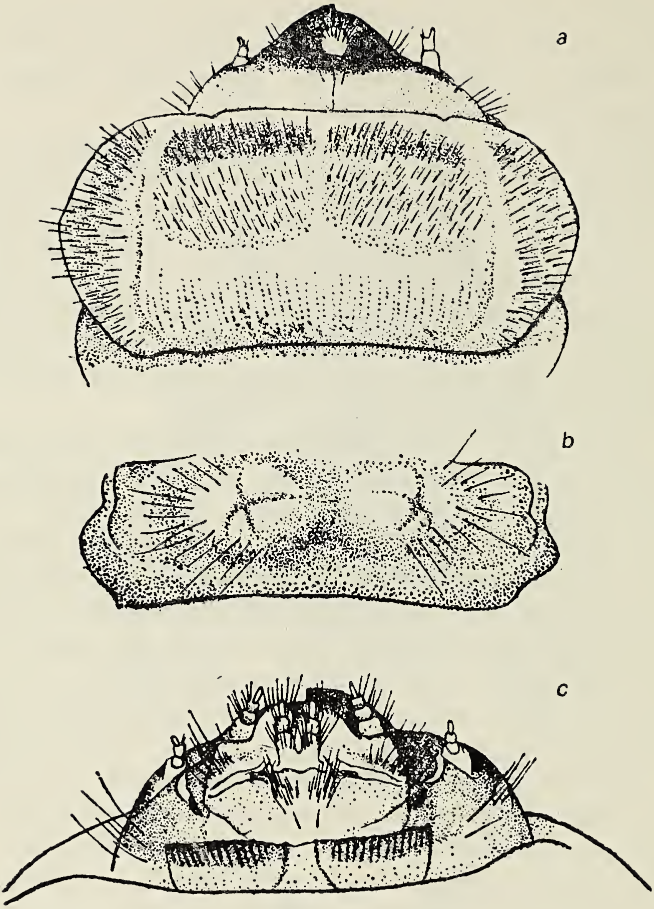
lateral bristles near apex short and light brown. Notch between parameres deep or not so deep, rounded or slitlike toward front. Phallus narrow, elongate, narrows cuneiformly toward apex, pointed at end, brownish, and with dense punctation.

Hind femora barely (male) or significantly (female) short of elytral apex. First segment of hind tarsi equal in lengh to all other segments together, including claw. Body, antennae, scutellum, and legs black. Elytra red, with broad longitudinally oval black spot that is posteriorly broadly rounded before posterior slope of disk (f. *typica*). Sometimes black spot covers scutellum toward front and joins posterior black border (ab. *basilaris* Pic), or one reddish spot remains on black background along sides of scutellum (ab. *horni* Heyr.), or rarely, elytra entirely black (ab. *niger* Bodem.). Body length 8.5 to 15.0 mm.

Egg: White with yellowish tinge, oval, not elongate, and almost equally rounded at poles. Chorion translucent, with minute indistinct, barely perceptible sculpture. Length 1.8 mm, width 0.9 to 1.0 mm.

Larva (Figure 143): Differs from larvae of other species of this genus in distinctly patterned anterior margin of hypostoma and characteristic hairy cover on pronotum. Head narrows slightly toward front. Epistoma insignificantly and smoothly depressed at apex, transversely convex near rusty-brown border. Median longitudinal suture distinct in posterior
239 half of epistoma. Hypostoma with broad rusty and distinctly longitudinally patterned border on anterior margin (pattern consists of light longitudinal groove with dark carinae protruding between, that gradually reduce in length from lateral hypostomal sutures toward gular plate). Each sclerite of hypostoma with up to 12 or more longitudinal carinae. Gular plate with parallel sides toward front, laterally with distinct carina, width at anterior margin not same as width of hypostomal border. Clypeus short, trapezoid, with brownish tinge. Labrum convex, narrows toward apex, with rusty or light-colored bristles ringed basally, and with glabrous median longitudinal clearance. Labial submentum darker, with pair of widely separated short bristles. Submentum convex, transverse, laterally with sparse long, basally ringed bristles; bristles closer to middle small, without basal ring. All these bristles form two wide groups along sides. Maxillary palps thin, conspicuously protrude forward beyond apex of inner maxillary lobes

Pronotum transverse, oval or narrower toward front, disk in second third with two narrow transverse rectangular yellowish-rust spots, sides with larger lustrous spot; region of rusty spot, disk before shield, and sides with thin very dark rust hairs encircled by sclerotized ring at base;
240 rings near hairs on rusty spots much larger than in remaining places of pronotum. Ringed hairs form two jumbled transverse rows that constitute narrow crossband at anterior edge of rusty spots. Pronotal shield wide,

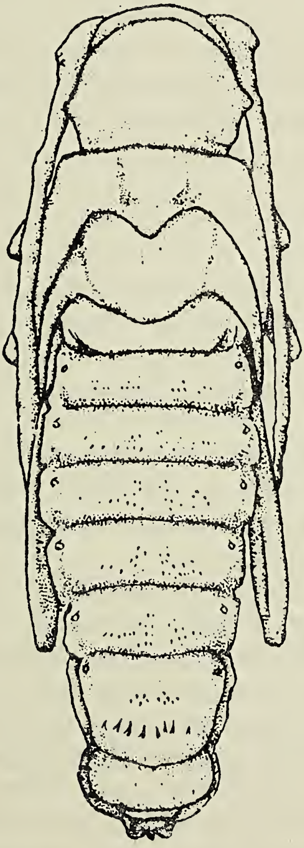


239 Figure 143. Larva of *Amarysius altajensis* (Laxm.). a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—head (ventral view).

with two slight notches on anterior margin, thin longitudinal pattern, bound laterally by deep longitudinal folds that almost reach anterior third, with narrow median longitudinal groove, pair of widely separated bristles on disk near groove, and three minute bristles posterolaterally forming transverse row. Presternum with tender long hairs on disk and sides, pair of transverse rectangular spots near anterior margin that are separated by narrow clearance. Eusternum rugulose, glabrous, and divided toward front by small hairy field. Thoracic legs well developed, with paired bristles on inner side, and very thin, poorly sclerotized claw.

Abdomen with thin rusty hairs on sides. Dorsal locomotory ampullae convex, leathery, divided by common median longitudinal groove, laterally with short longitudinal folds from which anterior transverse and posterior oblique grooves originate. Sometimes folds look stellate, radial. Ventral locomotory ampullae insignificantly convex, laterally with short deep longitudinal folds from which transverse groove originates medially. Abdominal segments IX and X with long light rust hairs forming fairly dense cover. Body length of mature larvae up to 18 mm, width of head 2.5 to 2.9 mm.

Pupa (Figure 144): Characterized by presence of more or less produced tubercle on sides of pronotum, poor development of sclerites on disk of tergite VII, convex and transversely elongate tergite VIII in female, and other characters. Head broad, short, appears transverse toward front, tubercularly convex on inner side near antennal base, with broad median longitudinal groove, flattened vertex, broadly rounded occiput, glabrous, without bristles. Antennae flexed to sides, bent forward in region of 8th to 9th segments, with apices adjoining ventral sides of elytra (female) or midtibiae (male).



239 Figure 144. Pupa of *Amarysius altajensis* (Laxm.).

Pronotum transverse, angularly produced laterally and here with more or less protruding tubercle, narrows insignificantly toward posterior and anterior ends, with narrow transverse groove near posterior margin, uniformly convex disk, medially with minute bristles visible only under high magnification, forming distinct or barely perceptible transverse stripe. Mesonotum convex, sometimes with stray and barely perceptible bristles along sides, with broad transverse groove in posterior half, and triangular, produced, anteriorly pointed shield on posterior margin. Metanotum slightly convex, with deep median longitudinal groove, laterally with stray short bristles, or without them, and posterior margin narrowly (female) or broadly (male) rounded.

Abdomen elongate, with almost parallel sides (female) or broadens in region of segment IV and narrower toward tip (male). Abdominal tergites convex, with shallow channel-shaped median longitudinal groove; sharp spinules near posterior margin form transverse stripe divided by longitudinal groove (eight to eleven spinules on each side of groove); anterior half with barely perceptible spinules or without them. Abdominal tergite VII transverse (female) or almost not transverse (male), suspended posteriorly; posterior margin raised, broadly rounded, and with seven to ten large spinules, either erect or bent forward, forming transverse row; disk slightly convex, with a few minute spinules forming clus-
241 ters or two transverse rows. Tergite VIII transversely oval, markedly convex, lustrous, without spinules (female), or almost not transverse, rounded posteriorly, with stray thin spinules on disk (male). Valvifers of female separated, hemispherical or slightly elongate, and with small apical tubercle. Body length 9.5 to 18.0 mm, width of abdomen 3.0 to 4.0 mm.

Material: Collected in Altai, Upper Ob' region, Trans-Baikal, and Ussuri-Primor'e region. Adult insects 164, larvae 67, pupae—seven males and five females, larval exuviae with beetles from pupal cells 21.

Distribution: From Altai to the Pacific coast, including southern regions of western and eastern Siberia; northern Mongolia, northern China, and Korean Peninsula.

Biology: Inhabits forests and ecologically associated with various trees. Beetles emerge from end of May up to end of July. They are found in small numbers mid-June. They often visit flowers of Umbelliferae, Rosaceae, and other plants, and often mate on them. Subsequently they fly to deciduous trees and oviposit on shoots (0.8 to 3.5 cm in diameter) of viable trees of choke-cherry (*Padus*), hawthorn (*Crataegus*), willow (*Salix*), maple (*Acer*), oak (*Quercus*), and others. The female first scrapes minute hairy scales from the bark by means of a special brush located at tip of abdomen, then positions her ovipositor at an angle to the surface of the branch, lays an egg, and covers it with the scales collected previously. Hence eggs look like small tubercles blending with general background color of bark.

Under natural conditions larvae develop from eggs 18 to 20 days later, bore into bark without leaving egg membrane, first cut a small platform under bark, and then make longitudinal uneven galleries, deeply impressed in upper layer of wood, leaving a thin layer of bark on the outside. Throghout their galleries larvae make ventilation openings through which they discard some frass. Hence the galleries remain partly hollow, partly filled with frass, which is readily felt from outside the tree with the fingers. At some places the galleries broaden in the shape of a platform. Mature larvae move deep into wood, make a longitudinal gallery with a pupal cell at end, cut an exit from cell up to bark, close cell at both ends with fine frass, and overwinter in it. Length of gallery under bark 5.1 to 9.0 cm, width 0.6 to 2.0 cm, at places up to 3.0 cm; length of gallery in wood 5.5 to 7.8 cm, width up to 0.8 cm. Length of pupal cell 2.1 to 4.5 cm, width 0.6 to 0.8 cm. Length of plug made of fine frass, separating pupal cell from emergence exit, up to 0.5 cm.

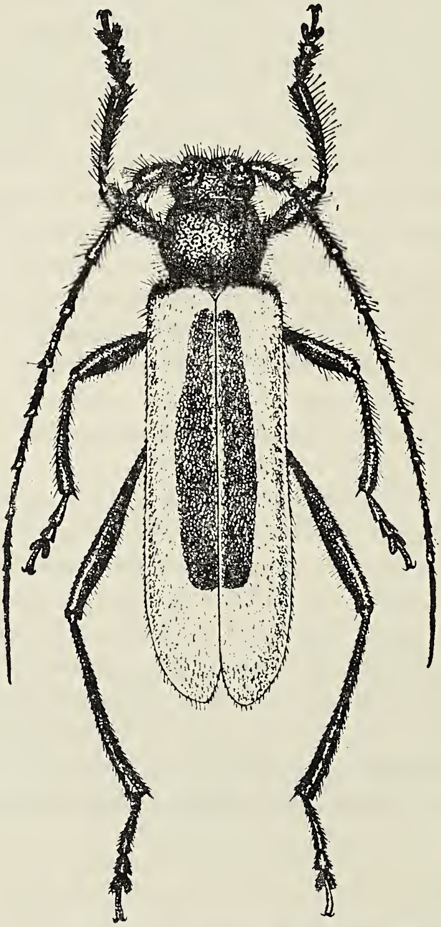
Pupation begins in May and terminates in June. Small number of pupae appear beginning of this month. Pupae lie in pupal cell with head toward exit, are found up to second 10 days in June, and develop in 16 to 22 days. Young beetles emerge from pupae at end of May and in June. They remain in pupal cell for up to seven days, then destroy plug at outlet, push frass aside, cut oval opening (4.0 mm × 3.0 mm to 5.0 mm × 4.0 mm) in bark on surface of shoot, and exit from pupal cell. Emergence of beetles from wood begins in early June and continues to second half of this month. Generation completed in three years. Weight (33 individuals weighed) of larvae before pupation 30.3 to 147.0 mg (some weighed 209.6 mg), pupae 27.0 to 136.7 mg, and beetles before emergence from wood 24 to 210 mg.

242 *Amarysius altajensis* (Laxm.) damages shoots of many trees and shrubs. For example, 76 beetles were raised from larvae collected in nature in the Ussuri-Primor'e region: 40 from maple, nine lespedeza, eight hawthorn, five white ash, four filbert, three pseudoacacia, two each apricot, willow, and briar, and one from linden. In addition, 86 insects (larvae, pupae, and adults) were collected during survey of forests: 39 from maple, 10 lespedeza, eight white ash, four oak, one Manchurian walnut, and 24 from other trees. In Altai several larvae, pupae, and beetles were collected from choke-cherry and sea thorn, and in the environs of Novosibirsk from oak (artificial plantation). Shoots damaged by larvae wither.

2. **Amarysius duplicatus** Tsher.

(Tsherepanov) Cherepanov, 1980, *Sistematika i ekologiya zhivotnykh* (*Nov. i maloizv. vidy fauny Sibiri*), pp. 91–93; Cherepanov and Cherepanova, 1971, *Nov. i maloizv. vidy fauny Sibiri*, 1973, vol. 5, pp. 19–24; *ibid.*; 1973, vol. 6, pp. 66–67 [*Amarysius altajensis* (Laxm.)].

Adult (Figures 145 and 146): Close to *A. altajensis* (Laxm.) but differs in more elongate elytra, shape of abdominal sternite V in male, structure of genitalia, and other characters. Head short, with large punctation, erect brownish hairs; genae with narrow smooth crossband bearing series of long brownish aristate hairs. Frons broad, with two smooth transverse depressions near anterior margin, markedly convex between antennae, and with median longitudinal groove. Vertex flat, occiput slightly convex. Eyes deeply notched, minutely faceted, and space between upper lobes of eyes not more, or even less than space between antennal

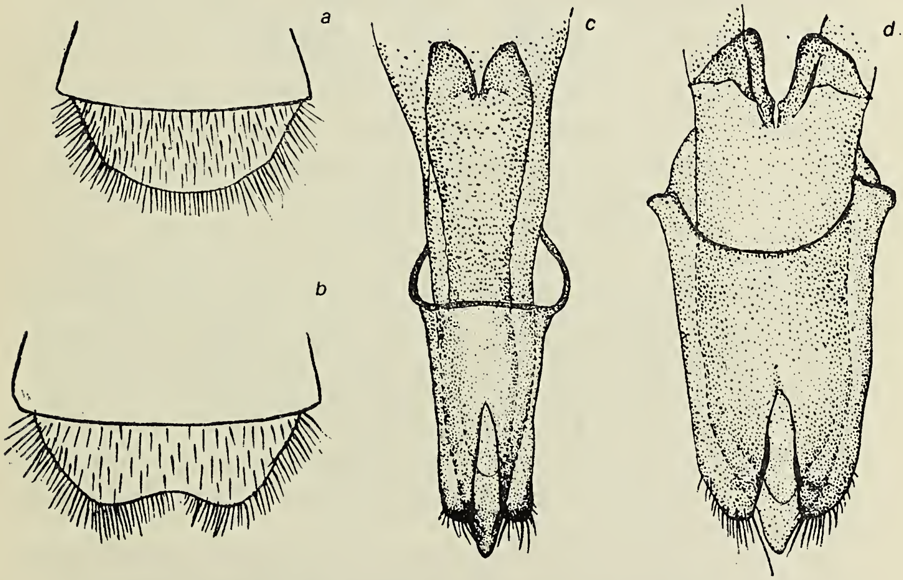


243 Figure 145. *Amarysius duplicatus* Tsher.

sockets. Tenth antennal segment reaches beyond elytral apex (male) or only up to posterior slope (female). First antennal semgent much shorter than 3rd, equal to 5th or 4th; 4th to 10th segments apically less (male) or more (female) elongate, spinelike, without longitudinal comb on inner side.

Pronotum laterally rounded, narrows more anteriorly, less posteriorly, with barely perceptible transverse grooves near posterior and anterior margins, disk convex, with dense deep punctation (spaces between punctures very narrow, septate), and long erect aristate brownish hairs (pronotum appears densely setaceous). Scutellum flat or with median longitudinal depression, length almost not greater than width, narrows posteriorly, triangular and pointed anteriorly, with minute punctation, and with adherent brownish hairs.

Elytra elongate, length 3.0 times width at humeri, parallel (male) or broaden slightly from base toward apex (female), apically with smoothly truncate outer angle, narrowly rounded inner angle; disk slightly convex, with faint punctation, and short semiadherent black hairs. Legs long; hind femora thicken slightly toward apex, insignificantly (male) or far from reaching (female) elytral apex. First segment of hind tarsi distinctly longer than two successive segments together. Body ventrally with sparse long semiadherent black hairs. Metasternum with large



244 Figure 146. Sternite V and genitalia of adult male.
a and c—*Amarysius altajensis* (Laxm.); b and d—*A. duplicatus* Tsher.

dense punctation, abdomen with very minute, not very dense punctation. Sternites of abdomen convex, with smooth posterior border. Sternite V apically notched (male) or with straightly truncate margin (female).

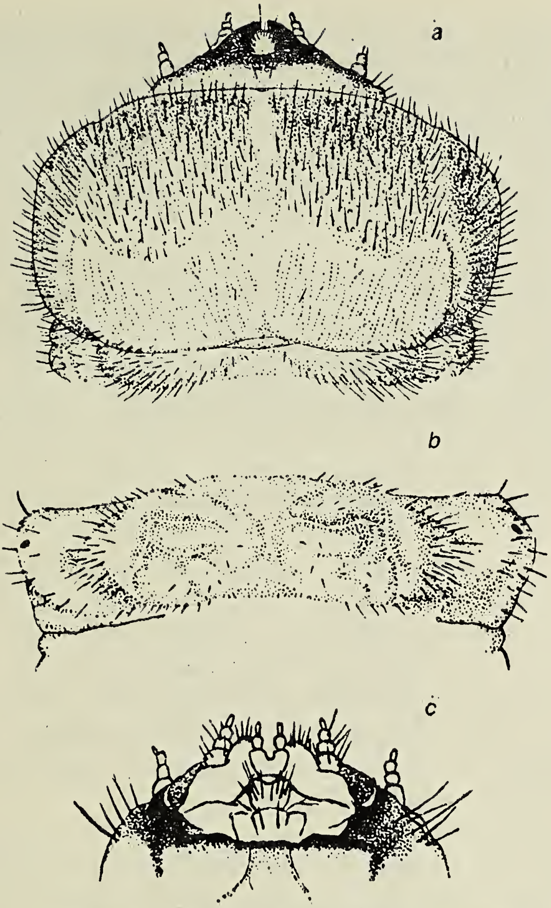
External genitaila comparatively broad. Phallobase broadly notched dorsally, with angular or rounded projection along sides of notch; ven-
243 tral processes of phallobase encircle phallus laterally, comparatively short, and slightly produced forward. Parameres broad; apically slightly shifted to upper side, narrowly rounded, and with long brownish bristles on inner apical margin; minute hairy bristles occur on sides, apex, and lower sides near apex. Notch between parameres narrow, slitlike toward front. Phallus broad, narrows slightly from base toward back side, sharply truncate at apex, and with elongate, finely punctate brownish tip.

Body, antennae, legs and scutellum black. Elytra red, disk with broad black stripe along suture that narrows near scutellum and is broadly rounded posteriorly in posterior third of elytra. This longitudinal stripe often broadens toward front, covers scutellum, and joins flat border posteriorly. Body length 10.5 to 14.0 mm.

Egg: Oval, with yellowish tinge, obtusely rounded at poles. Chorion matte, with fine alveolate sculpture, spaces between alveoli matte. Length up to 1.8 mm, width 0.7 to 1.0 mm.

Larva (Figure 147): Characterized by convex and indistinctly patterned anterior margin of hypostoma, short hairy cover on rusty spots of pronotum, and sparse hairs on tip of abdomen. Head markedly retracted into prothorax, narrows toward front. Epistoma with narrow notch on anterior margin near clypeus and dark rust border, distinct median longitudinal suture, without perceptible frontal sutures laterally, and with fair hairs behind brownish border forming transverse row. Hypostoma with narrow dark rust convex border on anterior margin, border with faint longitudinal pattern that gradually fades out. Parietals with broad rusty border on anterior margin that covers ocellar-antennal area from behind, and with sparse light-colored hairs behind border. Ocelli hyaline, located on ventral side, one near each antennal base. Clypeus small, trapezoid, with brownish tinge. Labrum very small, convex, longitudinally oval, with long light rust bristles. Mandibles short, broadly rounded apically, with basal transverse groove on outer side, black, dark red at base. Labial mentum broadens toward apex, convex, with five to seven lateral bristles forming almost median crossband here. Inner masticatory lobes of maxillae apically truncate, with short light-colored or brownish bristles.

Pronotum slopes markedly toward head, transversely oval, with broad rusty stripe in anterior third of disk that is divided by median narrow
244 white clearance into two large spots covered with short setaceous hairs; latter basally with sclerotized ring and constitute broad transverse field



245 Figure 147. Larva of *Amarysius duplicatus* Tsher.
a—head and pronotum; b—abdominal tergite with dorsal
locomotory ampulla; c—hypostoma.

here; short dense hairs before shield and on sides without sclerotized ring. Sides of pronotum with wide rusty spot in anterior half. Pronotal shield short, white, lustrous, with fine longitudinal pattern divided by narrow median longitudinal groove; anterior margin bidentate, laterally bound by deep longitudinal curved folds, and with or without bristles posteriorly near posterior angles. Presternum with short hairs on disk and sides with slightly elongate rusty hairs. Eusternum with two glabrous lustrous sclerites posteriorly, separated by narrow hairy field. Thoracic legs comparatively long, with thin acicular sclerotized claw.

Abdomen narrows indistinctly posteriorly, sides (mainly near locomotory ampullae) with short, not very dense hairs, and barely convex locomotory ampullae. Dorsal locomotory ampullae tubercularly produced, medially divided by common broad depression or narrow longitudinal groove, laterally with short longitudinal grooves from which one (in anterior half) or two transverse grooves originate radially toward inner side. Ventral locomotory ampullae similar in structure, differing only in that just one transverse groove extending inward originates medially from lateral longitudinal grooves of each ampulla. Abdominal segments IX and X with sparse, sometimes solitary hairs posteriorly, that do not form dense coat. Body length of mature larvae 18 to 20 mm, width of head up to 3.0 mm.

Pupa (Figure 148): Differs well from pupa of *A. altajensis* (Laxm.) in pronotum neither tubercularly nor angularly produced along sides, and in presence of large number of spinules on abdominal tergites. Body elongate. Head glabrous, without bristles, narrows in front of antennal base, with median longitudinal broad depression between antennae, sharp transverse depression, groovelike, at level of anterior margin of
245 eyes toward front on facial side; vertex flat, occiput broadly rounded. Antennae flexed to sides, in second half looplike, bent ventrad toward front.

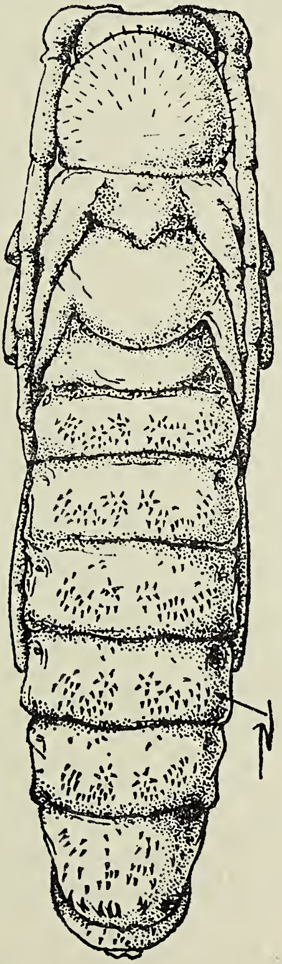
Pronotum transverse, laterally rounded, and not angularly produced, without tubercles, narrows more anteriorly and less posteriorly; disk uniformly convex, matte, with narrow median longitudinal groove, and with very thin, short, scattered, barely perceptible bristles. Mesonotum convex, with angularly produced shield on posterior margin, and laterally with a few minute bristles. Metanotum moderately convex, with median longitudinal groove, rounded posterior margin, and laterally with solitary, barely perceptible bristles.

Abdomen cylindrical, with almost parallel sides, broadly rounded apically in male, obtuse in female, and markedly convex on dorsal side. Abdominal tergites with narrow median longitudinal groove. Tergite I glabrous, without spinules. Posterior half of tergites II to VI with numerous minute sharp spinules forming dense, transverse, elongate, medially interrupted, broad stripe (with 25 to 30 spinules on each side of groove). Spinules in posterior rows of this stripe directed backward, in anterior rows in different directions. Tergite VII almost rectangular,
246 with rounded posterior angles; posterior margin with eight to ten large sharp spinules turned forward, forming transverse row; disk convex, with minute sharp spinules bent backward. Valvifers of female not very large, slightly separated, and with small apical tubercle. Body length 17 to 19 mm, width of abdomen 4.0 mm.

Material: Collected at Salair ridge and in Tuva. Adult insects 226, including 37 raised in laboratory from larvae collected in nature from spiraea, larvae 36, pupae—two males and two femlales, and larval exuviae with beetles from pupal cells five.

Taxonomic remarks: In general dimensions and color of elytra, adult insects are very similar to *Amarysius altajensis* (Laxm.). Hence they were earlier erroneously included under the latter. However, with reference to some morphological characters of adult insects (male), larvae, and pupae, the population of this group undoubtedly constitutes an independent species. Our collection comprised material from the forests of Salair ridge and Tuva. Not found to date in other regions. One may assume that this form is distributed sporadically in the forests of the Altai-Sayan mountain region.

Biology: Inhabits hilly and foothill regions of Altai. Ecologically associated with *Spiraea*. Emergence of beetles observed in June and July. During systematic collections in the summer of 1968 we collected 189 beetles in a linden forest of the Salair ridge, including 2.6%—beginning of June, 80.4%—middle, and 14.8%—end; 1.1%—beginning of July,



245 Figure 148. Pupa of *Amarysius duplicatus* Tsher.

and 1.1%—middle of this month. Beetles live for about four weeks, average 15 days. They visit flowers of various plants. During the reproduction period they are found on spiraea and oviposit on shoots 10 to 17 mm in diameter. Usually one egg each is laid on a shoot at a height of 18 to 51 cm from the soil surface. Eggs are covered with grayish scales collected from the bark and resemble small tubercles that are difficult to distinguish against general background of shoot. One female can lay up to 20 eggs in her lifetime. Ovaries of females caught in nature contained 13 to 14 eggs. Ovaries of one female dissected 14 days after emergence from wood contained 32 eggs, of which 14 were fully mature. Larvae hatch four days after oviposition. For example, from eggs laid by beetles on July 13 to 15 in chambers under a forest canopy, larvae began to appear August 14, i.e., 28 to 29 days later. Atmospheric temperature during this period ranged from 12 to 28°C, average 18.5°C.

Mature larvae bore into bark without fully emerging from egg membrane, make longitudinal gallery entire length of shoot, discard frass, and overwinter in this gallery. In spring they continue with a transverse gallery along a spiral that gradually penetrates up to pith, and then move upward discarding frass through ventilation openings. Each longitudinal gallery contains one to four openings that vary from 1.0 mm × 3.0 mm to 4.0 mm × 8.0 mm. Gallery remains hollow, not packed with frass, and larva moves freely in it from one end to the other. Before its third hibernation larva makes pupal cell up to 4.0 to 5.0 mm wide at end of gallery, packs part of gallery and ventilation openings with frass, and then hibernates. With the onset of warm weather in spring, larva cuts outlet in upper part of pupal cell up to bark, fills it with frass, and pupates. Pupae are oriented in pupal cell with head upward, i.e., toward outlet. Length of pupal cell 6.5 to 15.5 cm, width 0.5 to 0.6 cm. Total length of gallery in pith from place of entry of larva into bark up to upper end of pupal cell 17.5 to 34.5 cm.

Pupal development continued for three weeks in the laboratory at 20
247 to 24°C. Beetles emerging from pupae remain in pupal cell for five to seven days, after which they cut away frass from anterior margin of pupal cell, make an oval exit (3.5 mm × 3.0 mm to 4.0 mm × 3.5 mm) in bark and exit from wood through it. Pupae are found during May–June. Emergence of young beetles from wood begins in early June and terminates end of this month. After emergence from wood, beetles require supplementary feeding. Generation completed in three years (Table 16). Weight of larvae before pupation ranges from 110 to 240 mg, of pupae 90 to 220 mg, and young beetles after emergence from wood 57 to 176 mg.

Amarysius duplicatus Tsher. inhabits shoots of viable shrubs of *Spiraea* along banks of forest rivers, in floodplains, and near foothills.

Table 16. Periods of development of *Amarysius duplicatus* Tsher.

Year of development	April	May	June	July	August	September
1st	L	LPA	PAL*	AEL	EL	L
2nd, 3rd	L	L	L	L	L	L
4th	L	LPA	PAE	AEL	EL	L

*So given in Russian original—General Editor.

Damaged shoots wither and often break under snowload at zigzag galleries made by insects. Under such conditions the larvae complete development in the broken part of the branch. We found this species very often in forests along the Malyi Tesh River in the Salair ridge.

3. **Amarysius sanguinipennis** (Bless.)

Blessig, 1872, *Horae. Soc. Entom. Ross.*, vol. 9, p. 175 (*Anoplistes*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 611–612 (= *sanguineipennis* Bless.); Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 324; Kojima and Hayashi, 1969, *Insect Life in Japan*, vol. 1, p. 89.

Adult (Figure 149): Differs from previous species in entirely red elytra. Body markedly elongate. Head short, with dense punctation, erect black or dark brown hairs. Frons broad, transverse, with smooth transverse triangular platform near anterior margin, its angle directed upward, with deep median longitudinal groove, and tubercularly (almost spinelike) produced upward near antennal base. Eyes sharply and minutely faceted, broadly and deeply notched from inner upper side. In antennae 10th segment reaches beyond elytral apex (male) or only to posterior slope (female). First antennal segment thick, with large deep punctation, shorter (male) or almost longer (female) than 4th; 3rd segment longest; 4th to 10th segments with spinelike produced apex; 11th segment markedly produced, pointed at apex.

Pronotum slightly transverse (female) or width not more than length (male), narrows more anteriorly, less posteriorly, laterally rounded; disk convex, with dense, not very large deep punctation, long thin erect brownish hairs, and three smooth or punctate tubercles—two before middle, one in posterior half; sometimes at level of latter additional tubercle seen on each side. Transverse groove perceptible near anterior and posterior margins of pronotum. Scutellum triangular, flat, with median longitudinal depression, and with minute black hairs.

Elytra very elongate, significantly broaden from base toward apex, with narrowly rounded inner angle at apex, disk slightly convex, with two longitudinal carinae extending from base and almost up to posterior slope, with minute punctation, and with short black semiadherent 248

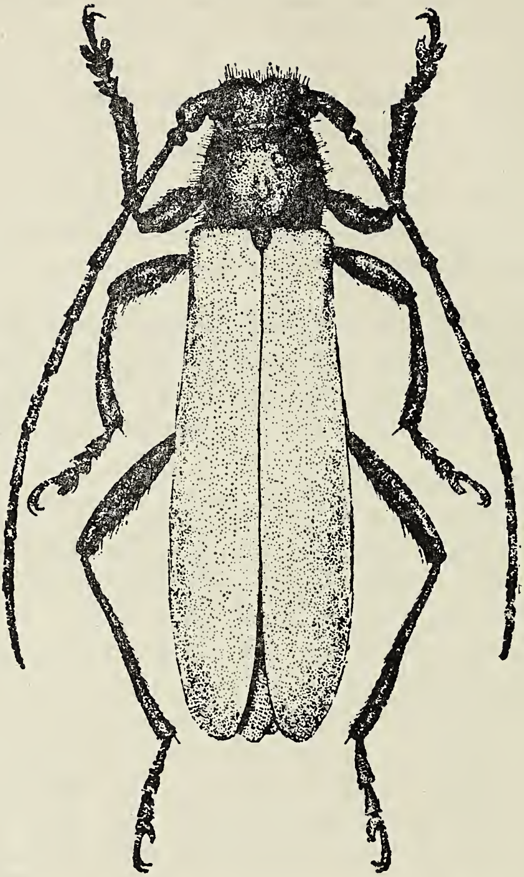


Figure 149. *Amarysius sanguinipennis* (Bless.).

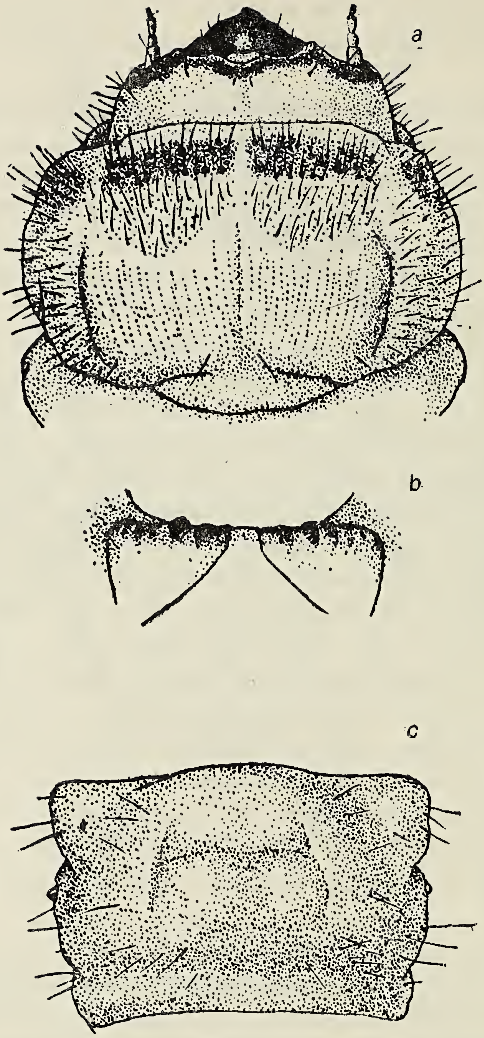
hairs. Legs slender, not very long. Hind femora gradually and insignificantly broaden toward apex, with apices not reaching posterior elytral slope. Body ventrally with semiadherent brownish hairs that bend more in thoracic region, and abdominal sternites with sparse hairs. Metasternum with dense large punctation, abdominal sternites with sparse minute punctation. Abdominal sternite V in male narrows angularly in second half posteriorly, transversely truncate at posterior margin or notched and here with dense short brownish bristles forming fimbria. Sternite V in female with almost parallel sides, very broad, with wide barely perceptible notch on posterior margin, and with short dense black hairs. Tip of abdomen with golden-yellow bristles forming dense brush. Body, antennae, scutellum, and legs black. Tibiae and tarsi sometimes with rusty tinge. Elytra monochromatic red, sometimes with yellowish tinge. Body length 13 to 20 mm.

Egg: Oval, broadly rounded at poles, and with yellowish tinge. Chorion translucent, covered with minute sculpture. Length 1.2 mm, width 0.8 mm.

Larva (Figure 150): Characterized by highly goffered anterior margin of hypostoma, long hairy bands on head, pronotum, and posterior end of abdomen. Head retracted up to 0.50 length into prothorax, with parallel sides or narrows slightly toward front. Epistoma with smooth lustrous brownish-rust border on anterior margin, with shallow and indistinct notch near clypeus or without it, and numerous hairs behind this border forming crossband, laterally fused with parietals (frontal sutures not visible), median longitudinal suture in posterior half distinct or indistinct. Hypostoma with parallel sides, straight sutures on sides, anterior margin with dark rust border and highly goffered here, with five to seven large longitudinal dark brown carinae. Gular plate rusty, broad, transversely rugose in anterior half and here divided by median longitudinal groove. Parietals with broad distinct dark rust border on anterior margin that covers ocellar-antennal area from behind, with long hairs in anterior half forming crossband that fuses with similar stripe of epistoma on dorsal side to form common hairy belt. Antennae notably slender; apices barely reach beyond anterior margin of cephalic capsule.
249 Ocelli hyaline, one located near each antennal base. Clypeus short, with brownish tinge. Labrum small, convex, narrowly rounded at apex, with long light rust bristles in anterior half and laterally. Mandibles massive, broadly rounded at apex, more uniform near base on outer side, and without transverse groove. Inner masticatory lobes of maxillae large, long, whitish, with thin light-colored bristles at apex. Maxillary palps thin, short; only last segment extends forward beyond apex of inner lobes.

Pronotum with parallel sides, in anterior half with broad rusty crossband divided by narrow white longitudinal clearances into four large spots (two on disk and two on sides), and anterior margin with long rusty setaceous hairs forming crossband. Pronotal disk with short rusty hairs between long hairy crossband and shield. Long as well as short hairs basally with sclerotized ring. Pronotal shield white, comparatively short,
250 bidentate on anterior margin, produced foward at anterior angles and medially, laterally bound by short longitudinal folds, divided by narrow median longitudinal groove, and with faint longitudinal streaks. Presternum slightly convex, with short and long (uneven) hairs basally with sclerotized ring, and pair of rusty spots in anterior half Eusternum glabrous posteriorly, lustrous laterally, with hairy field medially separating two round glabrous sclerites. Thoracic legs long, with long sharp claw.

Abdomen elongate, with almost parallel sides, laterally with light-colored, not very dense hairs, glabrous before and behind locomotory

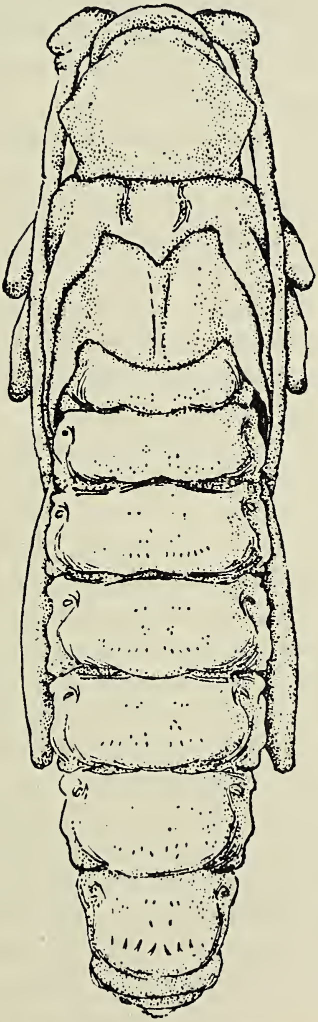


249 Figure 150. Larva of *Amarysius sanguinipennis* (Bless.). a—head and pronotum; b—hypostoma; c—abdominal tergite with dorsal locomotory ampulla.

ampullae, without hairs. Dorsal locomotory ampullae convex, leathery, divided by common median longitudinal groove, with longitudinal and obliquely directed (diverging backward) folds on sides that join with transverse groove in anterior half. Ventral locomotory ampullae divided by common, median, longitudinal, broad, channel-shaped groove, with short longitudinal lateral folds from which, sometimes, one short transverse groove originates medially toward inner side of each ampulla. Abdominal segment IX posteriorly and segment X entirely with long, rusty, comparatively dense, setaceous hairs with basal sclerotized ring. Hence tip of abdomen appears densely hairy. Body length of mature larvae 20 to 25 mm, width of head about 3.0 mm.

Pupa (Figure 151): Body with almost parallel sides. Head short, transversely convex between antennae, occiput broadly rounded, glabrous, without bristles. Antennae compactly flexed to sides, bent ventrad, ringlike.

Pronotum transverse, moderately convex, angularly rounded on sides, smooth, glabrous, without bristles. Mesonotum with triangular produced scutellum on back side, transverse saddle-shaped depression behind



249 Figure 151. Pupa of *Amarysius sanguinipennis* (Bless.).

middle, and without bristles. Metanotum moderately convex, with median longitudinal channel-shaped groove, broadly but insignificantly depressed laterally, and with rounded posterior margin.

Abdomen with almost parallel sides; segment V narrows slightly posteriorly. Abdominal tergites moderately convex, tergite I glabrous, other tergites with minute sharp spinules. Tergites II to VI with two rows of spinules: hind row consists of 12 to 16 (six to eight spinules on each side of median line); front row more jumbled, consists of four to eight smaller spinules. Tergite VII transverse, broadly rounded at posterior angles; eight to ten large sharp spinules bent forward form transverse row on posterior margin; two small spinules behind middle form middle row; and four minute sharp spinules form transverse row in anterior half. Tip of abdomen obtuse, without bristles and spinules. Valvifers of female elongate, with small apical tubercle. Body length up to 16 mm, width of abdomen 3.5 mm.

Material: Collected in Altai, Upper Ob' region (Tomsk), and Ussuri-Primor'e region, Adult insects 10, larvae 22, pupae—one female, larval and pupal exuviae from pupal cells with beetles two each.

Distribution: In the USSR from Altai, Tomsk, to the Pacific coast; northeast China, Korean Peninsula, Japan.

Biology: Inhabits deciduous plantations. Comparatively rare, found sporadically. Lives in thin shoots of oak, maple, birch, as well as lespedeza and filbert. Beetles emerge end of June to August. Females oviposit at tip of shoots up to 4.0 mm in diameter.

251 Larvae live in wood, make galleries in upper layer or along pith from top downward (from tip toward base of shoot), and do not fill them with frass. Larva moves freely in hollow gallery from one end to the other. Only part of gallery subsequently packed with frass. Pupal cell constructed at end of gallery longitudinal to shoot. Lower end of pupal cell compactly filled with fine frass and upper end with coarse fibrous frass, forming upper plug and separating pupal cell from remainder of hollow gallery. Length of plug on lower side 3.3 cm, on upper side 2.0 cm. Length of pupal cell 3.6 cm, width 7.0 to 8.0 mm. Length of gallery made by larvae ranges from 32 to 67 cm, width 7.0 to 10.0 mm. Larva pupates in pupal cell with head upward.

Pupation recorded end of May and in June. Pupae develop for about two weeks. Under laboratory conditions one larva pupated November 12 and the beetle emerged from this pupa on November 28, i.e., 16 days later. Air temperature maintained in the laboratory at 18°C. Fully formed beetles remain in pupal cell about one week, then cut round or oval outlet (4.5 mm × 5.0 mm or 7.0 mm × 4.5 mm) and exit from wood through it.

Emergence of beetles from wood begins in second 10 days of June and terminates in first half of July. By this time their gonads have matured and beetles are capable of ovipositing without supplementary feeding. Ovaries of one female recently emerged from wood contained 24 large mature eggs. Weight of larvae before pupation (three individuals) 132.9 to 215.0 mg, pupae 125.6 to 196.0 mg, and beetles 84.9 to 164.0 mg. One larva before pupation weighed 132.9 mg (100%), pupa 125.6 mg (95%), and beetle before emergence from wood 84.9 mg (63.9%). Thus the weight loss in this case during metamorphosis was 36.1%. One larva before preparation for pupation weighed 278 mg. Generation completed in two years (Table 17).

Table 17. Periods of development of *Amarysius sanguinipennis* (Bless.)

Year of development	April	May	June	July	August	September	October
1st	L	LP	LPAE	PAEL	AEL	EL	L
2nd	L	L	L	L	L	L	L
3rd	L	LP	LPAE	PAEL	AEL	EL	L

Amarysius sanguinipennis (Bless.) damages viable shoots of various deciduous trees, which subsequently wither. Beetles raised from larvae collected from shoots of maple, oak, birch, lespedeza, and filbert. In coastal forests of the Novosibirsk reserve this species inhabits shoots of viable birch trees in the crown of lower and middle tiers at a height of 4.0 m or more. Sometimes found on shoots of undergrowth.

4. **Amarysius grallator** (Baeckm.)

Baeckmann, 1924, *Rev. Russ. d'Entom.*, vol. 18, p. 233 (*Purpuricenus, Asiates*); Plavil'shchikov, 1940, *Fauna SSSR*, 22, 2, 612–613.

Adult (Figure 152): Similar to *A. sanguinipennis* (Bless.). Differs from this species in presence of narrow black stripe on elytral suture, dense punctation on 1st antennal segment, and produced tubercle laterally on pronotum. Head short, with dense punctation [spaces between punctures matte and with secondary minute punctation; in *A. sanguinipennis* (Bless.) they are smooth and lustrous]. Frons flat, with median longitudinal groove, lateral depression near anterior margin, tubercularly produced 252 near antennal base, and with sparse adherent hairs. Eyes minutely faceted and deeply notched. Antennae not longer than body; 1st antennal segment with dense fine punctation, without smooth platform at apex; 4th antennal segment equal to 5th, much shorter than 3rd; 6th to 10th segments cuneiformly produced at apex.

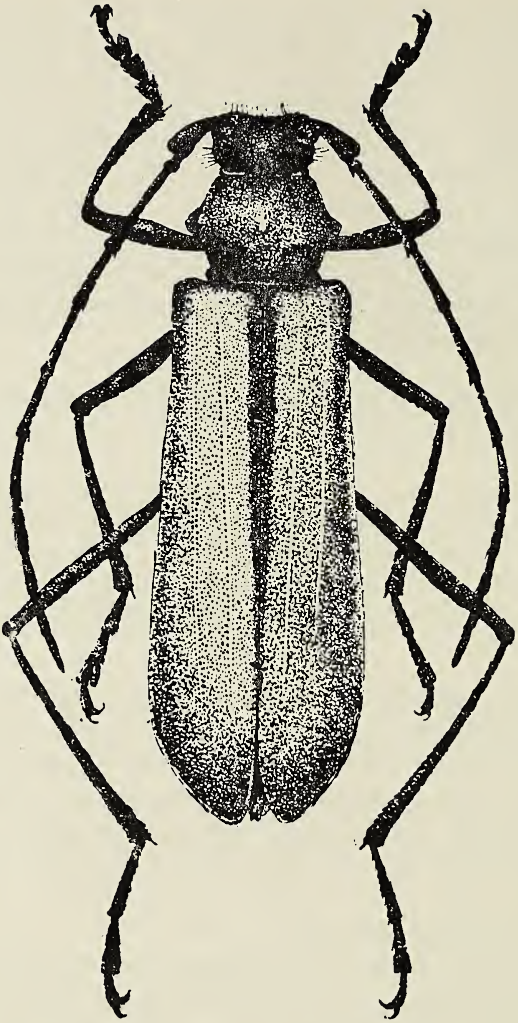


Figure 152. *Amarysius grallator* (Baeckm.)
(type specimen).

Pronotum transverse, with dense uniform punctation, with narrow septate spaces between punctures, laterally with produced conical tubercle, and disk with three smooth tubercular elevations—one in middle, two slightly ahead on sides; with large smooth depression behind lateral elevations, and protruding punctate elevation on posterior margin. Scutellum pointed anteriorly, with median longitudinal depression, and with fine dense punctation.

Elytra broaden toward apex, disk with pair of longitudinal light-colored carinate veins, with fine punctation and very short black hairs;

apex with narrowly rounded inner and smoothly truncate outer angle, and raised suture. Metasternum and abdominal sternites matte, with very dense punctation, and coated with fine adherent hairs. Legs long, slender; hind femora reach posterior elytral slope. Hind tarsi significantly shorter than tibiae, their 1st segment narrow, longer than all other segments together. Body length of female 13 mm.

Male: Not known.

Material: Described on the basis of five specimens preserved in the Zoological Institute (Emel'yanov): female, June 14, 1915, Ussuri-Primor'e region. Quite rare. We did not find it.

ADDENDUM

III. Subfamily Lepturinae

6. Tribe STENOCORINI

14. Genus *Pidonia* Muls.

253 7. **Pidonia amurensis** (Pic)

Pic, 1900, *Echange*, vol. 16, p. 81 (*Pseudopidonia*); Plavil'shchikov, 1936, *Fauna SSSR*, 21, r. 1, 242–244 (*P. amurensis* Pic, female); Plavil'shchikov, *ibid.*, pp. 248–250 (*P. signifera* Bat., male); Gressit, 1951, *Longicorn Beetles of China*, vol. 2, p. 72 (*P. amurensis* Pic, female); Gressit, *ibid.*, p. 74 (*P. signifera* Bat., male); Hayashi, 1968, *Bull. Osaca J. Women's Jr. College*, vol. 3, p. 35 (*P. amurensis* Pic); Cherepanov and Cherepanova, 1975, *Zhuki-drovoseki ivovykh lesov Sibiri*, pp. 44–48 (*P. signifera* Bat.); Cherepanov, 1979, *Usachi Severnoi Azii*, pp. 212–215 (*P. signifera* Bat.).

Taxonomic remarks: At one time Plavil'shchikov (1936) and Gressit (1951) erroneously included the male of *P. amurensis* Pic under *P. signifera* Bat. Soon after, based on biological studies, I (Cherepanov, 1970) synonymized *P. amurensis* and *P. signifera* Bat. However, after comparing beetles kindly provided by Dr. Kuboki from Japan, I concluded that these are two separate species, which differ well in genital structure and other characters. My studies revealed that the individuals labeled *P. signifera* Bat. by Plavil'shchikov and Gressit are males of *P. amurensis* Pic, whereas the insects labeled *P. amurensis* are females of the present species. Furthermore, according to Hayashi (1968), only *P. signifera* is distributed in Japan. Based on the foregoing therefore, all the abovementioned discoveries of *P. signifera* Bat. in the Amur and Ussuri-Primor'e regions, northern China, and the Korean Peninsula should be included under *P. amurensis* Pic.

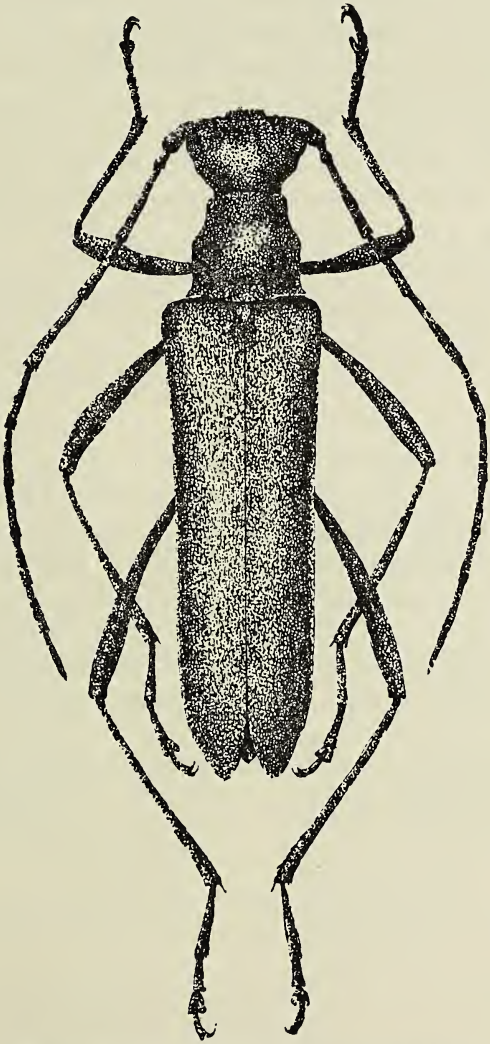
7. Tribe LEPTURINI

2. Genus *Grammoptera* Serv.

4. **Grammoptera plavilstshikovi** Heyr.

Heyrovsky, 1965, *Reichenbachia*, 5, 9, 101–105.

Adult (Figure 153): Differs well from *Grammoptera coerulea* Jurec in more elongate body, and from *G. gracilis* Brans. in presence of metallic bluish-green glaze on elytra. Body elongate. Head transverse, with dense flat punctation (spaces between punctures very narrow and septate), fine grayish hairs not forming continuous cover, transversely convex between antennae and here with median longitudinal depression; occiput slightly convex, almost flat, narrows markedly and roundly behind eyes, and with distinct cervical constriction. Eyes markedly convex, longitudinally slightly elongate, sharply and minutely faceted. Antennae slender, with apices reaching posterior elytral slope, and with short adherent rusty hairs. Third antennal segment longer than 4th, almost equal to 5th.



254 Figure 153. *Grammoptera plavilstshikovi* Heyr.

254 Pronotum barely narrows in posterior half, with almost parallel sides, narrows sharply toward apex (angularly on sides) in anterior half, disk convex, with very dense fine punctation, light yellowish adherent hairs from anterior margin backward, and from sides toward median line. Scutellum triangular, with large indistinct punctures and sparse adherent hairs.

Elytra elongate, with parallel sides, rounded humeral tubercles and slight depression on inner side, apex entirely rounded, disk convex, with very dense punctation creating faint pattern of transverse wrinkles, and with sparse minute semiadherent hairs. Body ventrally with sparse, compactly adherent, light-colored hairs. Legs long, slender; hind femora reach posterior elytral slope, slightly longer than tibiae. First segment of hind tarsi longer than two successive segments together. Body black, antennae with brownish rust tinge, elytra brownish-black with greenish-blue metallic tinge. Body length 7.0 to 9.0 mm.

Material: Ussuri-Primor'e region. Adult insects.—one, June, 1954.

Distribution: Ussuri-Primor'e region (Partizan: Ussuri reserve), northern Korean Peninsula.

Biology: Not studied.

The following key may be used in the identification of species of *Grammoptera* Serv.

Adult Insects

1 (4). Elytra black, without metallic tinge.
2 (3). Pronotum not laterally depressed in posterior half, narrows notably in anterior half toward head. . . . . 1. **G. gracilis** Brans.
3 (2). Pronotum distinctly depressed on sides in posterior half, therefore broadens in anterior half, and rounded at anterior angles. . . . . 2. **G. erythropus** (Gebl.).
4 (1). Elytra bluish-green or brownish with bluish-green metallic tinge.
5 (6). Body short, length 5.0 mm, and slightly elongate. Elytra bluish-green. . . . . 3. **G. coerulea** Jurec.
6 (5). Body length 7.0 to 9.0 mm, markedly elongate, Elytra brownish with bluish-green tinge. . . . . 4. **G. plavilstshikovi** Heyr.

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